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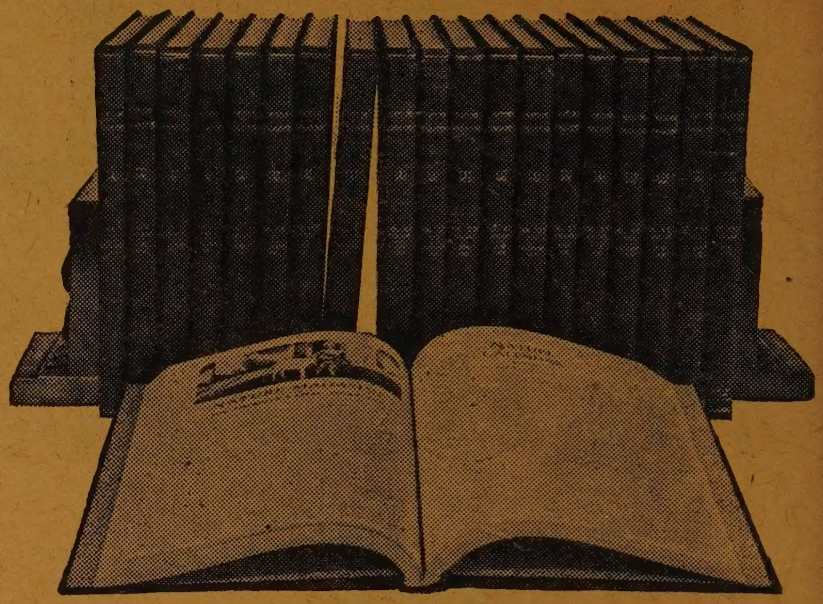

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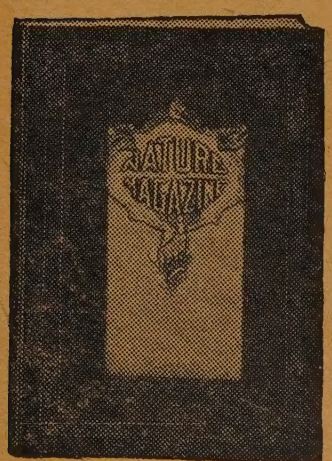

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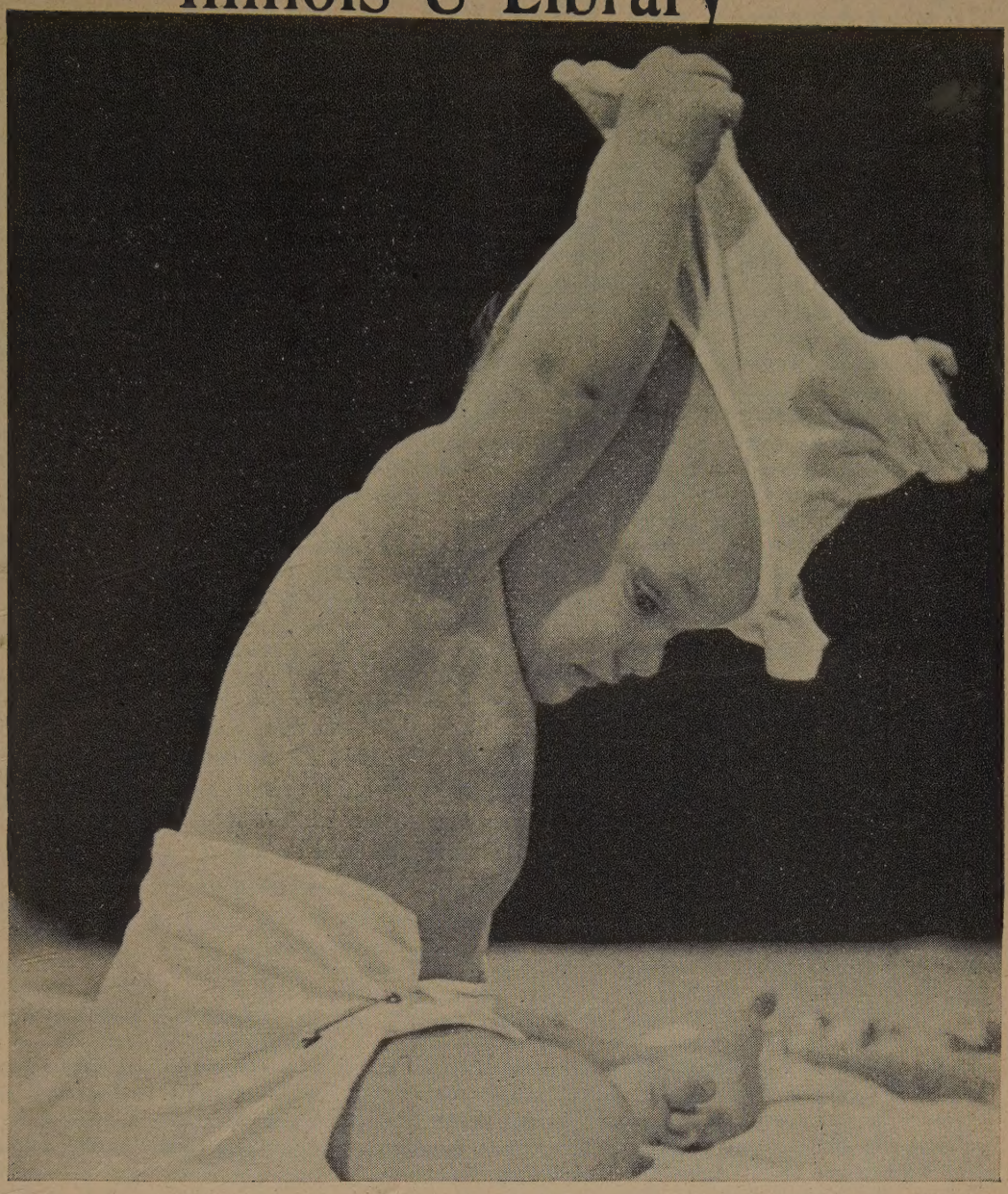

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Nature in Print

By HOWARD ZAHNISER

FROM the High Sierra of California to the seacoast of New England, or the in-between-land of marsh, lake, and muck in southern Florida, is a long journey in altitude, and longitude or latitude, but in the imagination or the library it is one that recent publications have made as easy as they have pleasant and satisfying.

The American Mountain Series, four volumes of which have previously been published under the editorship of Roderick Peattie, has already well established itself. The fifth volume, on *The Sierra Nevada*, under the guest editorship of the brother, Donald Culross Peattie, reaches a new high level, and presents to its readers a remarkably excellent collection of special articles. The American Lakes Series, which has already described each of the great lakes, as well as four lesser lakes, has likewise taken a commended place on the shelves. Its ninth volume, in which two scholars, man-and-wife collaborators, deal with Florida's Lake Okeechobee and its vast surroundings, will also seem to readers of this magazine to be one of its series' best volumes, ranking in this reviewer's opinion next to Grace Lee Nute's *Lake Superior* (although somehow or other the volume on *The Great Salt Lake* has escaped our attention).

A book that would, in any case, stand by itself is Haydn S. Pearson's *Sea Flavor*, although it may well be one of a Pearson series. Unfortunately this reviewer has missed Mr. Pearson's *Country Flavor* and *The Countryman's Cookbook*, but the volume at hand concludes with fifteen recipes that whet an appetite for the *Cookbook*, and we suppose *Country Flavor* to be a companion to *Sea Flavor*. In one of this new volume's hundred separate vignette essays, which together give one not only the flavor but also a good taste of sea and seashore, Mr. Pearson declares: "Fortunate is he who knows the pristine beauty of the day's birth when the sun seems to climb from beneath the waters of the eastern horizon." In another one, entitled "August Sea," he writes sensitively: "At day's end the sun lays a golden carpet on the glinting surface, and spectacular colors light up the clouds above the point where the red ball drops from sight. Dusk lingers for an interlude, fading into darkness as the day's curtains are drawn. Lights flash from the headlands to guide sea travelers on their way. August's night calm settles on the wide waters." Thus, from dawn to sunset, from the point of view of a hundred different subjects (including "Bayberries," "Jellyfish," "The Killdeer," "Beach Grass," "Teetertail," "Barnacles," and many other such topics), Mr. Pearson offers samples of the shore life. And in "Moonlight on the Ocean" he says: "There are many who find solace and renewed strength in the spirit of the sea. They know the ocean's moods through the year's seasons. Human hearts respond to spring's increasing beauty, to summer's peaceful interlude, to autumn's gathering grayness, to winter's cold barrenness. Many would agree, however, that one of the ocean's most appealing and heart-stirring times of loveliness is that of a late-rising full moon lifting from the water and unrolling a shining path across the waves." It is lovely indeed to contemplate a seashore vacation ahead in August, and here is just the volume for the not-long-sustained reading opportunities on such an occasion—not to mention the superb photographs that occupy so many of the pages. Nor will the volume be unwelcome at any season, or far inland, for there would seem to be a good savor in opening its pages at any convenient time in any likely place.

Those who eschew the languor of the seashore for the exhilaration of mountains are more likely to let their reading precede rather than accompany their excursions, and one can presume for many of them a deeper earnestness in their reading. Existing in mountains is for most of these vacationers more recreational than restful, and no qualifications are more severe than those for mountaineers. They will find an appropriate earnestness in the American Mountain Series, and specifically *The Sierra Nevada* will be found to be no dilettante's volume but rather one rich in fact and profound in interpretation. It is not, however, technical in either vocabulary or content, and, indeed, includes some of the most remarkably lucid and flowing writing ever prepared by specialists for lay readers. This is eminently true of Francois E. Matthes's "A Geologist's View," which should recommend itself most highly not only to laymen interested in geology but also to compilers of textbook samples of perspicuous prose. It is none the less marvelous because the reader quickly realizes that Mr. Matthes had an understanding of the Sierra Nevada that is almost as monumental as the great range itself.

The other contributors have been comparably excellent, whether Mary Tresidder and Charles Albert Harwell, describing with charm the trees and forests and the birds, or David Brower and Oliver Kehrlein writing with gusto of the strict disciplines called winter sports and mountaineering. Richard Joel Russell makes a chapter on climate interesting even across the continent, Idwal Jones flavors the volume with folklore, and Lester Rowntree's essay on flowers is both brilliant and delightful. Donald Culross Peattie, of course, introduces the volume with eloquence, and handsomely introduces each of the contributors. But it is Weldon F. Heald who gives the reader an introductory general view of the "Sierra Panorama" and a perspective in history, in the volume's Chapter II, called "Empire in the Sky." On his first page Mr. Heald also introduces John Muir, who might well be described as the volume's hero, and appropriately under the influence of John Muir writes as a conservationist, whether descriptively or historically, from there on.

The High Sierra, Mr. Heald points out emphatically, "is a wilderness only by courtesy." And he continues: "To keep it that way constant alertness is necessary, backed by acts of Congress and elaborate laws. That there are still great empty slices of the West, roadless, undeveloped, and virgin, is an illusion. Moreover, what little remains of the primitive West in isolated nooks and corners has been preserved only because some people have been interested enough to fight tooth and nail to keep it unspoiled." Of these fighters John Muir was the great forerunner, but Weldon F. Heald and his fellow members of the Sierra Club are certainly maintaining his effectiveness. All of us throughout the nation owe them a great debt, and as readers we may also feel a gratitude that these experts on the Sierra, who write so well of this range, which is a region, with national parks and national forests, are themselves inspirited with a zeal for its preservation for the future. It is hard to imagine how any mountains could be better represented than by this volume, *The Sierra Nevada: The Range of Light*, and there are few recently published books more deserving of the attention of serious readers anywhere who are seeking a better understanding of our American outdoors and wishing to gain this through pleasant reading. The volume is also well illus-

Rain at Sea

By SARA VAN ALSTYNE ALLEN

The hundred hills of water rise
To break the lances from the skies;
Desolate and wild and free
The meeting of the rain and sea.
Where reefs are hidden far within
The sudden, fierce, white ripples spin.
A cloud of water, now the rain
Needles the ocean; that vast pain
Is ours, and ours the peace
When at last the lances cease.

trated with a selection from the brilliant photographs with which such artists as Ansel Adams and Josef Muench have long carried to far distant eyes the wonders of Yosemite, Sequoia, Sierra, and the marvels they contain.

It is a far different sort of country, and a rather different sort of study, too, that Alfred Jackson Hanna and Kathryn Abbey Hanna treat in their volume *Lake Okeechobee: Wellspring of the Everglades*, but the differences are of a sort that make one thankful for variety and unwilling to spare any of the great natural features of the earth. In this low country of Florida, say the Hannas, "there are no awe-inspiring silhouettes such as feature the Rockies, yet a deep impression is made on human sensibilities. This is derived from the mystical and strangely enveloping atmosphere of timelessness experienced when one penetrates the watery wilderness of dense hammocks, broad marshes, extensive prairies, large mangrove swamps, spots of pinelands, rivers, lakes and little islands." The words were written specifically of the newly established Everglades National Park, yet one surmises they apply well to so much of this country as is still in a natural state. Apparently they are not for Lake Okeechobee itself. Where hurricane-blown waters and floods have caused death and property damage to the human beings who seem to insist on developing the lands around the lake, there are now levees, and the Hannas write: "The lush beauty of the lake shore is gone forever, as are the scenic vistas across the great expanses of water." But the national park, although much south of Lake Okeechobee, is now a reality, and the spectacular wildlife of the region is apparently now fated for preservation. Here it is the National Audubon Society that for years, even as at present, has been the chief conservation instrument for combating the forces of exploitation and destruction. The Hannas are well aware of the role the Audubon Society has played in their State, well aware, too, of the wilderness values still there, and their book is attentive to these features of the region and its history. It is, indeed, a volume on the region, not alone on the lake, and is to be read surely by anyone interested in the human-history background and in the economic circumstances of the Everglades preservation effort. Most readers will doubtless be amazed at the region's long-continued and strangely eventful human history. As the Hannas write, following an effective introductory-chapter description of the area, its natural features, and wild inhabitants—"This land of Lake Okeechobee so superlatively endowed and fashioned by nature has been refashioned by man." *Lake Okeechobee* is dominantly concerned with man and his refashioning experiences. "Within Okeechobeeland," its authors say, "are a vegetable kingdom, a cattle kingdom, and an agro-industrial empire," and they devote most of this new volume in the American Lake Series to explaining how these kingdoms, this empire, were built—and to describing the kind of people who built. "Today," they say, "it is one of the most arresting scenes in America." They recognize the achievements of the developers; they also declare: "But no defense of modernity can escape the admission that ruthless forces of destruction have invaded the lake region and that what remains of its beauty and wildlife demand protection for survival." Not only students of history and folkways but also conservationists who share in this demand for protection will find *Lake Okeechobee: Wellspring of the Everglades* to be a volume as valuable as it is vivid and thorough.

Lake Okeechobee: Wellspring of the Everglades. By Alfred Jackson Hanna and Kathryn Abbey Hanna. (In the American Lakes Series, edited by Milo M. Quaife.) Indianapolis and New York: The Bobbs-Merrill Co. 1948. 379 pp., with editorial introduction by M. M. Quaife, 21 photographs on 16 plates, 6 text maps, end-paper maps of Florida and Lake Okeechobee, lists of sources, bibliographical notes, and index. $4.

Sea Flavor. By Hayden S. Pearson. New York and Toronto: Whittlesey House, McGraw-Hill Book Co., Inc. 1948. xii—178 pp. with 32 full-page photographs. $3.50.

The Sierra Nevada: The Range of Light. Edited by Roderick Peattie, with an introduction by Donald Culross Peattie. Contributors: Weldon F. Heald ("Sierra Panorama" and "Empire in the Sky"), Lester Rowntree ("On a Trail of Beauty"), Mary Tresidder ("The Trees and Forests"), Francois E. Matthes ("A Geologist's View"), David R. Brower ("Winter Sports"), Idwal Jones ("Mother Lode Folk"), Charles Albert Harwell ("Some Birds of The Sierra Nevada"), Richard Joel Russell ("Sierra Climate"), and Oliver Kehrlein ("Yosemite, A Mecca for Mountaineers"). New York: The Vanguard Press, Inc. 1947. 398 pp., with 27 photographs on 17 plates, 2 text figures, folding topographical map prefaced by Weldon F. Heald and drawn by Joseph F. Hirsch, and index. $4.50.

The Alphabet

The Alphabet. By David Diringer. New York. 1948. Philosophical Library. 607 pages. Illustrated. $12.00.

This scholarly work carries the subtitle "A Key to the History of Mankind." It is that, at the same time being a history of the alphabet, or, better, alphabets. From the scattered studies of scholars the author has brought together, from oriental and occidental sources alike, material for a fundamental work on a basic subject. It is an immensely valuable volume.

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Portraits in Music

Recently we saw some fascinating motion pictures, the work of Mr. and Mrs. Ray Garner, who are pioneering a new field in outdoor-scenic-travel movies. The Garners calls these films "Portraits in Music," intimate, personalized studies of an area. They leave out human beings, seeking to present Nature as you would see it yourself were you to venture into these areas. The pictures are built around or fitted to the music, and the music is the key to operations in the editing room. One of these lovely color films is called "The Pointed Mountains," and presents the Grand Tetons fitted to Beethoven's First Movement of the Ninth Symphony. A second film is entitled "House under the Rim," a striking picture of the cliff dwelling at Be-ta-ta-kin, with mood music and poetic dialog. A third film is that of Havasu Canyon in the Grand Canyon system, with the Second Movement of Beethoven's Seventh Symphony serving the purpose of the musical portrait. The Garners also have a notable film showing Mrs. Garner and two mountain-climbing guides scaling to the top of Grand Teton, a thrilling and spectacular film. If you hear of the Garner films in your vicinity, do not miss them.

Cave Men

Modern cave men are known as speleologists, and they are banded together in the National Speleological Society to "stimulate interest in caves and to record the findings of explorers and scientists within and outside the Society." Claustrophobics find no place among their membership, for these men and women will go anywhere to seek out the secrets hidden in caves. They are the explorer types. Every once in a while they get out a bulletin, the contents of which carry out the stated objectives of the Society. The most recent of these publications is Bulletin Ten, under date of April, 1948. It covers the caves of Texas in 136 pages of articles by a number of authors. Anyone interested in caves, or in Texas, will find this eminently worth the two dollars asked for the paper-bound edition, or the three dollars for the cloth-bound edition. Orders may be sent to the National Speleological Society, 510 Star Building, Washington, D. C.

Wild Flower Guide

Beginner's Guide to Wild Flowers. By Ethel Hinckley Hausman. New York. 1948. G. P. Putnam's Sons. 376 pages. Illustrated. $3.50.

Covering more than one thousand species of wild flowers, this is a simple guide for the amateur student. It includes all except the rarest flowers found east of the Mississippi, and is useful as far west as the Rocky Mountains. The book is illustrated by 1000 individual line drawings of the flowers discussed.

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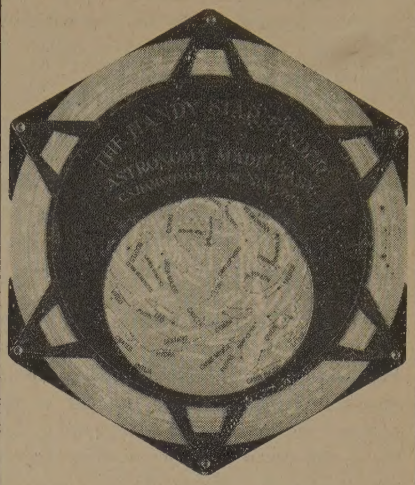

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NEW ZEALAND MEETING

By GRACE E. BARSTOW MURPHY

In February, 1949, there will be held in New Zealand a Pacific Science Congress. One of its main themes will be a Symposium on Conservation.

My husband and I spent the "summer" of 1947-48 in New Zealand, from early November to mid-March. He was sent there by the American Museum of Natural History, where he is Chairman of the Department of Birds. We met the foremost naturalists and conservationists in the country.

The fact that conservation is of so far-flung an interest today is one of the perhaps unappreciated good tidings for a world in turmoil. When the use of the soil and the economy of Nature are understood and cared for as man-made engines everywhere are cared for, there will be less hunger and consequently more hope, for all peoples. We pay for our engines, but Nature has made gifts. We have misused the gifts to acquire more engines. Mankind is gradually waking up to its own deficit. The steady, plugging work of the practical conservationist, in both research and application, is really bearing fruit. The more conservationists gather together, as in this coming meeting of distinguished men, the more hope there is for the world's health and resultant good behavior.

There could not be a better meeting-place than New Zealand for many reasons. Three fundamental ones are her history of early despoliation, the dreadful ignorance of the pioneers, and the modern, lively grasp at rehabilitation. The fact that New Zealand is compact and small, with a moderate climate and amazing variety of natural arrangements, makes for intensive experiment and resulting knowledge.

The fact that New Zealand has a Socialist Government, which has its hand, in a pleasantly paternalistic way, over just about everything within its borders, may help to make possible a general practice of, as well as a general education in, good conservation methods. Also, the country has comparatively little turmoil, so more people are free to take her progressive matters to heart. All the forest reports that I have seen express appreciation to campers and picnickers for their co-operation regarding fires. As all New Zealanders seem to camp and to picnic, it would appear that the public is pretty well awakened. Much is being done to catch the erring ones who may too easily undo the good work of all the thoughtful ones. The newspapers are constantly full of conservation news. On the Otago Peninsula in South Island, my husband and I, under the guidance of one of New Zealand's foremost naturalists, were clambering about among nesting yellow-eyed penguins. Two countrymen came up to make sure we were not harming the birds! On the other hand, some city ignoramus had thrown a stone at a nesting royal albatross, injuring its wing so that it had to be killed.

So, although New Zealand has come a long way, there is still much to be done, and this Congress will be good for her, as well as good indeed for every single scholar who can get to it, both for himself or herself, and for the widening influence of the effect at home.

It is generally known that New Zealand, in isolation, developed an economy of Nature that included no mammals whatever except two small bats. Her bird-life and vegetation were, in consequence, wholly unadjusted to any predaceous animals of any kind. With the approximate size and climate of Great Britain, the middle-class British pioneers, steeped in British tradition, set out to duplicate the land that many of them still, perhaps, over-emphasize as "home." With total disregard of the balance of Nature, plants and animals were imported wholesale. The result has come near to being chaos. It is the modern New Zealander's Chinese puzzle, and he is attempting to solve it.

It is a shock at first to pick up one book after another and find that animals we at home are fond of, are here called "pests"—deer, elk, rabbits, opossums and little weasels we all like to catch sight of in American woods. But when one sees forests that have no replacing seedlings coming up because the deer have cleaned out the underbrush, and when one learns that opossums and pigs have wiped out areas of burrow-nesting petrels, and that the whole bird-life of New Zealand has suffered to terrific proportions from animals there had been no provision for, one quickly calls them pests one's self. These mammals, brought in from the outside, have no natural enemies in an economy not created for them, so their numbers increase beyond any ability of the country to support them.

In the vegetation, English gorse and broom overrun the whole country, so that men are employed merely to cut out their masses. They do not belong where sheep are to be grazed.

Perhaps the saddest piece of destruction in New Zealand has been the wanton waste of forest, with the resultant damage by erosion to water-tables and to river-beds. Here the work of the New Zealand Forestry Service appears to be of splendid value. I read in a publication of 1909 that the magnificent kauri tree would soon be extinct. Now, in 1948, I have not only seen the remaining kauri forest cared for and productive, but I have also seen the gleam of affection on many New Zealand faces for this unique and magnificent tree that dominates wherever it grows, straight, unblemished, powerful in every way. It is almost worth a trip to New Zealand to see kauris. Although there is still anxiety about it, I do not believe that the lugubrious 1909 prophecy will be fulfilled.

But much forest has gone, and the soil has suffered in the methods used in clearing it. The native Maoris had used fire, but there were not as many of them as there are of whites. Their Garden of Tane was sacred to them, and they loved and named their trees. The British burned and reburned for pasturage. The problems inherited from such practice in bare hillsides, poor soils, silted riverbeds which mean flood-danger, are very great, and are being ardently tackled. The whole situation presents one of the most interesting and constructive studies to the inquisitive conservationist, to be found on the earth. Surveys could not fail but be of value in relative work, in other lands.

The standard of living in New Zealand is not as high as in our country. Actual travel is different from ours. But no small discomforts should weigh in the balance for the earnest conservationist who will come to New Zealand next year for the Congress.

Fungus Wanted

Specimens of the fungus known as *Polyporus rutilans*, or *Polyporus nidulans*, are wanted for scientific study. This fungus contains substantial amounts of "polyporic acid," a rare chemical desired for research on its chemical properties and possible uses. Supplies of the fungus, from a single fruit body up to a few pounds, will be much appreciated if sent to Dr. Robert L. Frank, 252 Noyes Chemical Laboratory, University of Illinois, Urbana, Illinois. Naturally, the sender will be reimbursed for any shipping expenses involved.

Polyporus rutilans, although not common, is to be sought in the fall on dead deciduous wood, mainly hickory, but also poplar, maple, beech, and some oaks, and others. It is a "shelf" fungus protruding horizontally from the wood, and is rather thick, convex above and below. Specimens are found up to four inches long and three inches wide. The color ranges from pale yellow to flesh color or tawny-copper, and penetrates throughout the fungus. The top surface is smooth, not divided into zones. The lower surface is porous, typical of the pore fungi. When fresh, it is soft and fleshy, and said to have an anise-like odor. Dried specimens are also somewhat fragrant. A good test for the identity of *Polyporus rutilans* is to place a drop of household ammonia on the fungus and note the resulting purple color.

Correction

In the June-July issue we carried a brief article about "Fresh-water Sponges," classifying the pictured *Pectinatella magnifica* as a sponge. This is, in fact, a Bryozoan, a fresh-water animal quite far removed from the sponges, and, certainly, not scientifically classified with them.

Contents Noted

FROM Gertrude Charny of Chicago, president of Friends of the Birds, comes a plea to say something about conditions under which such cage birds as canaries or lovebirds are kept in stores prior to sale. She points out that the cage bird traffic subsided during the war period, but that it is now going full blast "with greater horrors than ever." These birds are being kept and sold in tiny boxes four by six inches in size. "No living being has greater right to liberty than a bird," writes Miss Charny. She suggests that it would help if people would protest to the owners and managers of pet stores where such conditions exist, and go elsewhere if the condition is not remedied. We have never kept, or desired to keep, any cage birds, but if certain kinds are doomed to a life of captivity we see no reason why they cannot be allowed the maximum of liberty all along the way from breeder to purchaser. We have long thought that humane organizations should pay more attention to pet stores than they do.

THOSE attending the recent annual meeting of the American Planning and Civic Association in Newark, New Jersey, got as hearty a laugh as the billboard interests must have had over a couple of large billboards proclaiming welcome to the APCA. This organization has long been in the forefront of the fight for roadside and billboard control, and we doubt that the signboard people are so naive as to think that such a poster gesture of welcome would be regarded as other than a sly joke. Still, we are not certain, for we have never detected much in the way of a sense of humor in the solemn statements of the billboard industry. With a straight face, the director of public policy for the General Outdoor Advertising Company recently came forth with a statement about the subservience of the billboard industry to the public interest. He urged the donation of space to civic and national non-commercial enterprise, saying: "For decades we, in the Outdoor Advertising Industry, like other media, have contributed our facilities for this purpose, recognizing that today no business can survive unless it serves the public interest. We try to do more than justify ourselves economically; we try to live the part of a public servant." If the billboards on the rural countryside, in their competition with the scenery and their menace to safety, exist there in the public interest, we are crazy, which, no doubt, the billboard boys think, is the case.

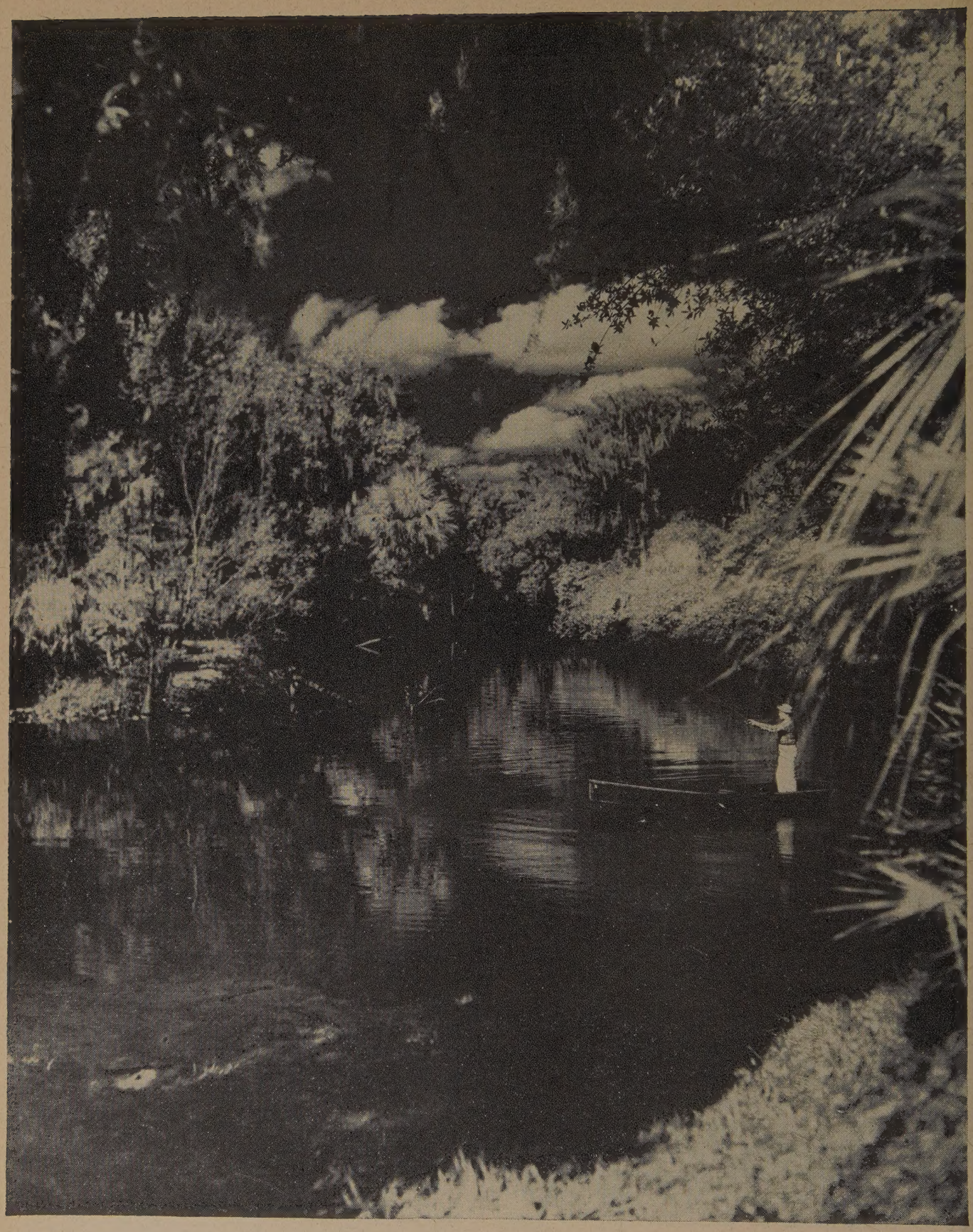
MILLIONS of years ago a coniferous tree of the genus *Metasequoia* was widely distributed over the northern hemisphere. Its fossil remains have been found in rocks, but none younger than those of the Miocene, twenty million years ago. Some two years ago, however, reports came from interior China that three trees of this presumably extinct species were growing there. To verify this Ralph W. Chaney, paleobotanist of the University of California, and Milton Silverman, Science Editor of the *San Francisco Chronicle*, set out for China. After an arduous trip, through bandit-infested country, they found the trees, and, more, a hundred or more of the dawn redwoods in a nearby valley. These trees shed their leaves in winter and have large branches that extend upward, but their cones and wood indicate their relationship to the California redwoods of today. These trees, which have miraculously escaped destruction through the centuries, are probably doomed by the dire need of the Chinese farmer for firewood, but Drs. Chaney and Silverman returned with specimens of wood, bark, leaves and cones that should reveal data about these ancestors of the California redwoods, which the Save-the-Redwoods League is working to preserve for posterity.

UNDER the provisions of the law establishing the so-called "duck stamp", breeding and resting places acquired with funds raised from the sale of this stamp were to be set aside as *inviolate* sanctuaries for migratory waterfowl. Other areas, purchased for similar purposes, have been designated as refuges, although the conditions surrounding the acquisition of some of these areas made them, in part, public shooting grounds, either on sections of the refuges themselves, or on immediately contiguous lands. Creation of the refuge system, however, was important, and such concessions may have been necessary to achieve the ends sought.

Now comes Senator A. Willis Robertson of Virginia with a bill—S.2482—that would authorize the Secretary of the Interior to open to public shooting not to exceed twenty-five percent at one time of the *total* area of such reservations. No exception is made for those sanctuaries originally set aside as inviolate. We believe that this bill represents a betrayal of a trust; that it is an unjustifiable sop to the duck gunners. Furthermore, those areas, shot over on what would be a sort of rotation basis, would quickly become repositories of quantities of lead shot, and, consequently, continuing and increasing sources of lead poisoning to the birds. Under the terms of the measure areas would not be opened if the number of birds frequenting them, in migration or otherwise, were determined to be on the decline. This is loose protection.

We believe that this bill should never reach the floor of the Congress. It is now in the hands of the Senate Committee on Interstate and Foreign Commerce, specifically with a sub-committee of that committee headed by Senator Homer A. Capehart, Senate Office Building, Washington, D. C. All friends of wildlife should register a protest through Senator Capehart.

R. W. W.



FNPS PHOTOGRAPH

Colorful water plants, shy orchids and graceful palms dominate the tropical water course that lends its name to the Hillsborough River State Park, near Tampa, Florida. The park is a paradise of beautiful and distinctive plant life. Many rare and lovely orchids may be seen on the ancient oaks bordering the Nature trails. Wildlife also may be easily observed.

PHOTOGRAPH BY HARMON

Wood ibises and American egrets at Myakka River State Park, near Sarasota, Florida. Living on one of the finest natural wildlife sanctuaries in the country, Myakka's bird life is particularly impressive, both in variety and abundance.

Florida's Varied Parks

By LEWIS G. SCOGGIN

MANY people think of Florida only in terms of a winter holiday. While there may be some reason for this, for those interested in Nature the varied offerings of the State are present all the year. In nearly fifty thousand acres of State Parks, Florida preserves wildlife and plant life, such phenomena as disappearing rivers and vanishing lakes, historic shrines, and virgin country. In so doing, the Florida Park Service follows a policy of keeping these areas as nearly as possible as Nature created them, holding man-made developments to a minimum.

In the vicinity of Marianna, in the valley of the Chipola River of northwest Florida, is Florida Caverns State Park. This area preserves strange landscapes of subterranean splendor, with surprising contrasts in forests, plants and wildlife above ground.

Outstanding physical characteristics are the underground caverns, which have been opened and lighted for public visitation on guided tours. Here, the visitor can see the amazing network of passageways, the limestone escarpments, the underground river, the icicle-like formations hanging down from the ceiling, the heavier ones projecting from the floor, the great columns that seem to support the rock above, the prehistoric sea shells imbedded in the walls and ceiling. The temperature remains at about 63 degrees F. through the year.

Woodlands above the caverns seem to be borrowed from the North and set down in the middle of the semi-tropical forests of the Gulf Coast. In the swamps of the Chipola River, only a half-mile stroll from the vicinity of the caverns, visitors find a hardwood hammock; and, beyond the hammock, there is a slash pine forest of the South. However, over the caverns themselves, there is a typically northern maple-beech forest, where the sun filters through easily and the underbrush is scattered and graceful.

Beeches, numerous hickories and oaks, gums, and hackberries and other fruiting trees furnish a rich food supply for wild turkeys, squirrels and many small woods rodents, which, in turn, help to support numbers of owls, foxes and other carnivorous birds and mammals. Hunting is not permitted in any Florida state park. Nature trails lead to many beauty spots, filled with music of birds by day and calls of frogs and katydids by night.

Featuring a combination of old plantation charm, passed down from the days before the War between the States, rare scenic beauty, botanical and historical interests, Torreya State Park is located on the high bluffs of the Apalachicola River, 13 miles north of Bristol, 25 miles south of Chattahoochee, and 50 miles west of Tallahassee in Liberty County, northwest Florida.

Torreya State Park is believed to be the only place in the world where *Torreya*, or gopher wood tree, and the Florida yew may be found in natural growth. It was largely to preserve this section of the native habitat of *Torreya*, along with other interesting plant-life in the area, that the state park was originally established in 1935.

The *Torreya* tree was found by Hardy Croom of

Tallahassee, a planter and botanist, who discovered it while waiting for a ferry across the Apalachicola River. Unable to identify the tree, he sent samples to Dr. John Torrey, a leading American botanist, who, in turn, sent them to an English authority. He sent them to an internationally known French botanist. The latter determined that the specimens represented a totally new tree and named the genus in honor of Dr. Torrey. The Florida yew is even less abundant than the *Torreya*.

Historical values of Torreya State Park are noteworthy. Within the park, on Neal's bluff, 165 feet above the river, is the old Gregory mansion, which has been restored and furnished in ante-bellum period furniture. Far below Logan Hill on the river bank stands the two-story, log warehouse, built by the Federal government in the days when steamboats contributed materially to the industrial and commercial prosperity of this area. Rock Creek and a number of springs and brooks add primitive charm to this 1058-acre park. Indian Relic Ridge, vestiges of the War between the States, variety of plant life, and a bold and rugged terrain attract scientists, student groups and Nature enthusiasts.

Visitors could easily imagine that Camp O'Leno State Park, situated about 20 miles south of Lake City and six miles north of High Springs, was recently developed out of a perpetual wilderness, which borders the Santa Fe River in north-central Florida. "O'Leno," however, has quite a history. The site was the crossroads of travel in this section, before the War between the States, because of its location on the old Spanish Trail and the fact that here was a natural bridge over the Santa Fe River.

In 1934, the state purchased 160 acres at the old site of O'Leno for the establishment of a forestry training camp, but the area of Camp O'Leno State Park today totals 1380 acres. The site was considered ideal because of a dense stand of Florida's important trees, mixed pines and hardwoods, offering a splendid opportunity for exploration by the naturalist and botanist. Nature trails have been established.

A new scene meets one's gaze in Gold Head Branch State Park, known for its pot-hole lakes, sand hills, and pine forests. It is situated six miles northeast of Keystone Heights and 40 miles southwest of Jacksonville.

The park takes its name from Gold Head Branch, a spring-fed stream that meanders along the bottom of a beautiful, wooded ravine through which winds a Nature trail. The stream varies from three to ten feet wide, with crystal-clear water flowing over a bed of white sand. Minute quantities of gold that have been panned in Gold Head Branch probably came from the ancient rocks of the Piedmont Plateau. Growing along the Nature trail in the ravine, which is 65 feet deep, there are nearly 100 species of trees, shrubs and vines, including the needle palm.

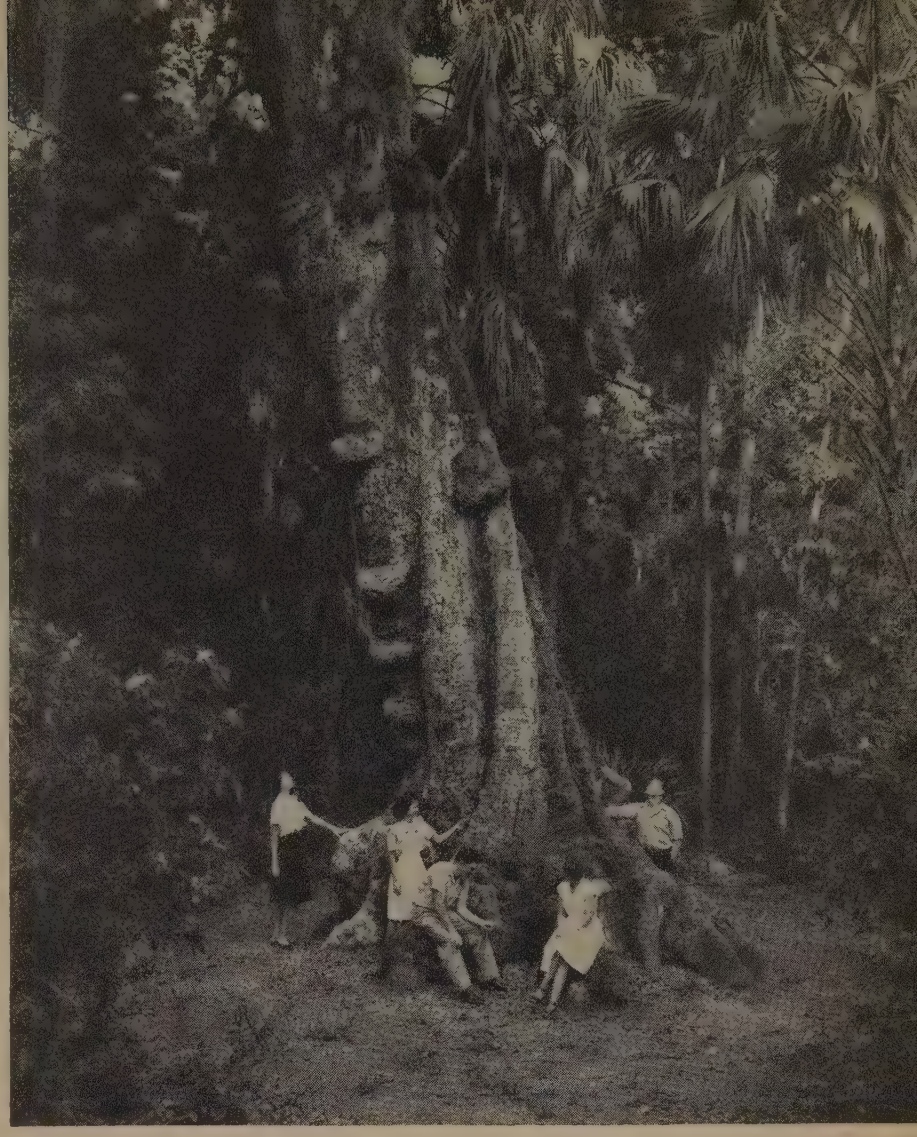
The pot-hole lakes fed by underground springs, the sinks, ravines and other geological features provide an interesting study. Educational facilities include field trips, ravine trails and a small Nature center. The entire park area has been fenced and is maintained and protected as a wildlife refuge.

Remains of an old dam and mill mark the site of a water mill, which had been operated years ago by the waters of Gold Head Branch. Parts of the machinery, which were found when development of the park started in 1935, may still be seen at the old mill site. Fragments of arrowheads have been found, indicating that the area must have been a favorite Indian hunting ground during earlier times.

Nature trail at Fort Clinch State Park, near Fernandina, Florida. A tropical jungle, once the rendezvous of pirates, now invites exploration.

The primary reasons for dedicating this area to public use and enjoyment are to preserve the wildlife inhabiting the area; to conserve all natural and scenic assets, and, at the same time, to answer the social needs for a rural place of natural recreation for the people of north-central Florida.

Northeast of Tampa is the Hillsborough River



PHOTOGRAPH BY HARMON

Laurel Oak at Highlands Hammock State Park, near Sebring, is thirty-one feet in circumference at the base and between 800 and 900 years old. This is one of the three large oaks that have had tree surgery performed on them, which will materially lengthen their lives. While this work was in progress, the cavity in the base of the above Laurel Oak was large enough to cover twelve grown men. It has forty tons of concrete and reinforcing steel in it. This state park comprises 3800 acres.

State Park. This lush, sub-tropical park, with an abundance of wildlife, borders the banks of the Hillsborough River. Since its formal dedication in 1938, this has grown to be one of the outstanding state parks in Florida, with an attendance record of 73,898 chalked up at the end of the fiscal year, June 30, 1947.

A noteworthy physical characteristic is the Hillsborough River, which flows between rock-ribbed banks and rushes over two sets of rapids, the sound of which, during periods of low water, is audible for a considerable distance. As far as is known the rapids are the only ones in a Florida river, and put to test the ability of the best boatmen. The bottom of the river is composed of limestone formations. The banks, too, are formed of limestone with a covering of sandy loam, thickly cloaked with undergrowth and with large trees growing to the water's edge. Tall cabbage palms, hardwood trees and a fine stand of cypress are found along the river's banks. There are no lakes in the park area, but there are a few small natural cypress ponds. These ponds are shallow depressions that fill with rain water during the summer season and become practically dry during the winter.

Spanning the river in the middle of the park is a graceful suspension bridge, at the north end of which a Nature trail begins, winding around in the hammock for a distance of almost a mile. The plant life along this trail is rich in variety and quality. One old oak forms an arch over the trail and is a veritable aerial garden with ten varieties of orchids, ferns and airplants. Another old oak, overhanging the river, is cloaked with clusters of fantastic butterfly orchids. Those seeking education in the ways of Nature will find ample space for the study of wildlife, geology, botany and forestry.

Alligators from six inches to three yards in length may be seen almost any time in Highlands Hammock State Park, six miles from Sebring in the center of the peninsular portion of the state. They are not in cages or fenced in, but roam freely in the shallow waters of the park. In this jungle-like park catwalks are built over the cypress swamps. There is a magnificent profusion of trees, abundant wild deer and beautiful birds. There are more than two miles of scenic drives through this sub-tropical hammock; another ten miles of foot trails. There are groves of trees 100 feet high with trunks as large as 31 feet in circumference. Three gigantic oaks have been preserved by modern tree surgery; one of these oaks contains forty tons of concrete and steel reinforcement. It is believed to be about 900 years old.

The area is underlaid with limestone, in which the remains of numerous prehistoric animals have been found. Canals, dams for water control, small streams, bridges, trails and catwalks have been constructed, but as far as possible this natural jungleland has been left in its primeval state.

Southwest of Highlands Hammock, between Arcadia and Sarasota, there is a park differing greatly in character. The broad, flat flood-plain of the Myakka River is covered with grass of an emerald sheen, studded with thousands of bright wild flowers that change its color scheme through the year. Bordering the river is a forest of palm and live oak trees.

Myakka River State Park is one of the last strips of true wilderness in Florida. This 16,700-acre state

Entrance to Fort Clinch State Park, near Fernandina, Florida. A dense forest, which shelters the rich hammock lands beyond, runs north and south along the border of the flatland area.

park and the adjacent Myakka River State Forest comprise more than 27,000 acres, all under a rigid system of protection for wildlife and conservation of natural resources.

One of the finest natural wildlife sanctuaries in the eastern United States, Myakka's bird life is particularly impressive both in variety and abundance. Some of the species occur in flocks of hundreds, and their plumage is gorgeous. There are large flocks of wading birds and other waterfowl, many of which are rare in other parts of the country.

Generally speaking, the entire surface of the park is flat, thus lacking any conspicuous geologic feature. A single major stream, the Myakka River, flows through it in a southwesterly direction. A single, hard-surfaced highway bisects the park roughly from east to west, to the north of which lies Upper Myakka Lake, while south of the highway is the Lower Myakka Lake, the only permanent bodies of water to be found within the park.

As the river recedes to its bed upon the cessation of the rainy season, a broad flood plain appears. It is here, especially along the upper reaches of the river, that the flood plain is transformed into a blanket of blue and gold formed by acres of the blue prairie iris and the golden ragweed. With the coming of each season, the scene changes, ending the year with the lower flood plain transformed into acres of gold by millions of wild sunflowers, which cover the floodplain of the river, extending far out into the inundated areas. From the esthetic viewpoint, the water hyacinth forms a water garden that is hard to beat when in full bloom, but, from the economic standpoint, it is a menace to navigation.

A visit to Fort Clinch State Park, situated three

Fantastic formations are shown here at Florida Caverns State Park, near Marianna, Florida. The formations include stalagmites, stalactites, columns, drapes, flow masses and pools in interesting form and color. Droplets of mineral water, dripping for thousands of years, formed these highly artistic features in this wonderland of underground caves.

PHOTOGRAPH BY CLINE

Deer are not afraid of visitors, but only curious, in Myakka River State Park, near Sarasota, Florida. The park is a wildlife preserve and breeding ground, and hunting is not permitted.

miles from Fernandina on the north end of Amelia Island in Nassau County, gives the traveler a new experience in changing scenes among Florida's outstanding historic and colorful regions.

Amelia River, Cumberland Sound and the Atlantic Ocean form the west, north and east boundaries of this 1085-acre park, while picturesque sand dunes and a dense hardwood hammock add to its beauty.

The entire island of Amelia is rich in history, dating back to 1562 when Jean Ribault, a French Huguenot, visited the island. The fortress was named in honor of Gen. Duncan Lamar Clinch, a veteran of the War of 1812, the Indian Wars, and later the Mexican War. During the War between the States, both Confederate and Union forces occupied the fort at different times.

Physiographical features differ from many southern coastal state parks. The shore is bordered by low tidal sand dunes; back of the sand dunes, there is a wide expanse of flat lands covered with beach grass, sea oats, myrtle, yaupon and other plants. A dense forest, which shelters the rich hammock lands beyond, runs north and south along the border of the flat land area. Inland, there is a marsh where the vegetation changes from live oak, pines, palms, sweetgum to a vegetation of willow, buttonbush, holly, pickerelweed, and smartweed, all water-tolerant.

Along the shore, depending upon the season of the year, there may be found terns, willets, black skimmers, plovers and other birds of the shore. Quail, doves, sparrows, and rabbits are among the animals usually found between the beach and the woodland. The swamplands abound with various species, including waterfowl, wading birds, squirrels, raccoons, minks, alligators and turtles. Willow Pond, located a mile from the fortress, is known for its many species of birds.

In Florida's system of state parks, Floridians and visitors will find areas of magnificent natural beauty. Each unit in the park system has been chosen because it is representative of the particular charm of a major area in a state that is widely variant in its climate, topography, flora and fauna. Each state park has its own individuality and offers outstanding features. Each makes an appeal to those who love Nature's beauties and who thrill to the outdoors, regardless of the age or the walk of life of the individual.

★

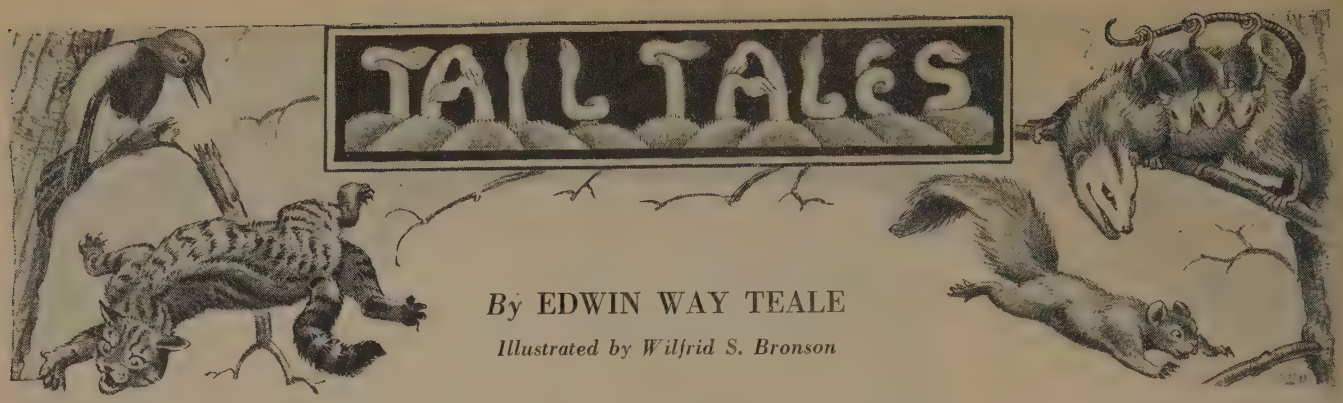
Blossoms Under Moonlight

By IDA ELAINE JAMES

Oh breathless joy upon a summer night,
Beholding blossoms under moonlight, white
With whiteness strange and sweet.

Thick clusters of pink roses, tender, pale.
Wax orange-blossoms massed white faces, frail
With loveliness too fleet.

I cannot bear to leave them there alone;
Long I stand and watch them, still as stone
At night's so radiant feet.



TAIL TALES

By EDWIN WAY TEALE

Illustrated by Wilfrid S. Bronson

MANY years ago, I wrote a syndicated editorial that I called "The Pig's Tail."

A cat, I pointed out wisely, has a tail that *is* a tail. It helps her maintain her balance when she walks along a back-fence. It is furry enough to wrap around her feet and keep them warm in winter. It is long enough to form a kind of lightning rod and warn of danger from the rear.

Other animals also have tails of some utility. The long hairs of a horse's tail provide it with an efficient fly-swatter. A dog's tail is a barometer of emotion. A woodpecker's tail is a brace and a prop when it clings to the bark of a treetrunk. But what does a pig's tail do?

Nothing, I concluded. It is not long enough to curl around its feet and keep them warm. It is not strong enough to form a prop, or hairy enough for a fly-swatter. It is a mere spinal raveling—a blemish on an otherwise streamlined body.

That is what I thought. But not for long! No sooner did the editorial appear than my mailbox overflowed with letters. Farmers took their pens in hand to set me straight. Butchers laid down their cleavers to heckle me. Pig-raisers took delight in ribbing an ignoramus. There appeared to be some sort of a fraternity of Friends of the American Porker at work. The barrage continued for weeks.

Did I not know, the letters asked, that the curl in a pig's tail shows its physical and emotional condition? Did I not know that a limp-tailed pig is a sorry sight? Did I not know that a porker with its tail tightly curled is something to gladden the heart of the farmer? Furthermore, had I not heard that, in some circles, pigs' tails are considered a great delicacy and bring a fancy price?

The final stroke, however, came from a man of seventy-five, a retired farmer living in Champaign, Illinois. If, he inquired blandly, I were trying to catch a pig in a barnyard, would I not appreciate the convenience of having a handle at the rear? Just how would I hold a pig if it did not have a tail?

From that day forward, I have been a changed man. No more have I referred to anything in Nature as entirely useless. Things may seem pointless. They may appear devoid of utility. But that is just because we do not know enough. Once we comprehend their possibilities, we usually discover they have many uses—as many as the tail of a pig.

There is, for instance, the matter of other tails in the animal kingdom. The uses to which they are put are amazingly varied. They form tools, and weapons, and means of locomotion. They are used for everything from breathing mechanisms to catapults, and from plows to pantries.

Everyone is familiar with the tiny, red-eyed *Drosophila* fruit fly that swarms around bunches of overripe bananas. Most people know the important part it has played in the study of genetics because of the rapidity with which generation follows generation. But few people are aware of the wonderful way in which the children of some of these flies, the wingless larvae, travel through the air by using their tails as springboards. Bending their bodies like bows, they grasp their tails in their mouths. Then, as they suddenly let go, they are tossed aloft. Catapulting through the air in this manner is their strange form of locomotion.

One whole group of primitive insects, the springtails, have a somewhat similar method of moving about. A locking mechanism beneath their bodies holds the end of their bristle-tails when they are curved forward. Whenever the insect wishes to move, it simply releases the locking mechanism. The tail straightens out, and its owner is hurled forward in a leap through the air. Some springtails appear on the surface of snow during mild spells in mid-winter. At times, their numbers are so vast they look like patches of dust blowing about. These insects are commonly known as snow fleas. Other springtails hop about on the surface-film of water.

Under water, tails play an important part in the everyday life of aquatic creatures. They are the powerful propellers of the fish, driving them about or holding them against swift currents. In the sun-warmed shallow water along the muddy edges of ponds, tadpoles swim with tails they later lose, tails that suggest detachable outboard motors. The alligator uses its long lizard-tail, tapering and armored, for a propeller in water and a weapon on land. Pushed forward by its sinuous drive, it can swim like an otter, while one sidewise lash of the heavy tail on land can knock a man off his feet as though he had been

The author, peering into a Lilliputian lake within the knothole cavern in a tree in his orchard, watching what goes on.

hit by a club wielded by a powerful giant.

Among the underwater vegetation of ponds and streams, the nymphs of dragonflies creep about on six spindly legs. They move slowly. But when a dragonfly nymph wishes to make speed, it can become almost literally an underwater rocket. After drawing water into its body, it expels it forcibly from the end of its tail. This jet propulsion drives it forward in sudden spurts of speed.

Another aquatic nymph has similar ability. This is the immature mayfly. Still another distinction is held by this insect. Long appendages, frequently feather-shaped, extend back from the end of its tail. They are external gills. As the creature moves about, they are constantly bathed in water from which they extract oxygen. The nymph of the mayfly thus breathes through its tail. In the manner of a fish, it obtains its oxygen from the water.

Another odd creature, living a submerged existence during its early days, also breathes through its tail, but it breathes air. This is the so-called rat-tailed maggot. Ever since the days of the eighteenth-century scientist, Reaumer, who gave the creature its name, it has been of interest to entomologists. The offspring of the drone fly, *Eristalis tenax*, the rat-tailed maggot, feeds on decaying matter in shallow water. Every summer, I find several of these curious creatures in the water collected in a small knothole in an apple tree near my home. The adult flies lay their eggs on the water in small white rafts. The hatching larvae sink to the bottom. As they have no gills and must breathe air, Nature has provided them with the prototype of the submarine diver's air hose.

Their tails are drawn out into a long tube, which can be lengthened or shortened like a telescope. The tip is held above the surface-film by radiating hairs which keep it from sinking down into the water. Thus the immature flies spend their days and nights on the bottom of the Lilliputian lake within the knothole cavern of my orchard tree, all the while breathing through their hollow tails air from a far different realm beyond the surface-film. When their larval days are over, they enter this world as winged adults.

The surface-film of water, transparent and amazingly thin, is the roof of the world for many creatures that dwell in ponds and lakes and streams. Although it is so insubstantial we can neither feel nor see it, it is a solid support to mosquito larvae. From it, like the proverbal monkey, the wigglers hang by their tails. The surface-film is connected with still

"In the West, there is a lizard that sometimes employs an astonishing ruse to avoid being swallowed by a snake."

another odd employment for a tail. Female damselflies sometimes descend beneath the water to lay their eggs in submerged vegetation. Because they might have difficulty breaking through the surface-film again, the male damselfly acts as a kind of living locomotive pulling ahead of the female. The tip of its tail is equipped with a pair of claspers, which, like the coupling on a train, connect it with the damselfly behind.

When a squirrel leaps from branch to branch in a treetop, or a falling cat twists so it lands on its feet, its tail plays an important part in the procedure. It aids the animal greatly in maintaining its balance. In a different way, the long tail of the kangaroo —besides providing a kind of chair on which it can sit when at rest—acts as a balancer when it is making tremendous leaps through the air, standing erect and using its hind legs alone. A slow-motion version of an animal using its tail to maintain its balance is provided by the king crab, that primitive dweller in the sea that is shaped like a shallow dishpan with a slender spike-like tail projecting to the rear. The tail is a pry with which the crab rights itself when it is upset. Without its assistance, the horseshoe crab might never again regain its feet once it was overturned on the shore.

Potent and pointed arguments are represented by the tails of skunk and porcupine.

The tail of this sea-dweller is a lever. The tails of other creatures resemble plows and shovels and hammers. When an immature ant-lion digs a pit in the dry sand in which to catch its victims, its half-inch, seedlike body begins moving around in a small circle. The ant-lion always walks backward. The tail of its flattened body, tilted down, cuts into the sand like a plowshare. As the quartz-grains slide up along its back, it gives convulsive jerks of its head to throw the sand to one side. Moving in a narrowing circle, and using its tail for a plow and its head for a shovel, it produces its conical pit.

The tails of several animals aid in the identification of tracks left in snow, mud or sand. Thus the dainty dear mouse usually leaves visible evidence of its slender tail. The muskrat registers its tail tracks beside its watery home; here the turtle also, dragging its smooth plaston, often leaves its mark.

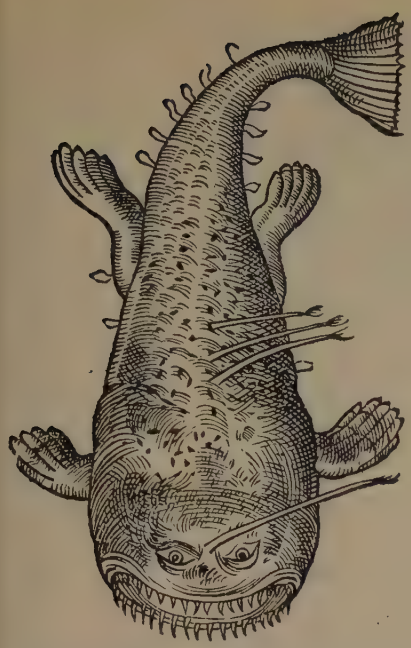
More aggressive is the part played by the tail of the porcupine. The stroke of its tail driving home quills and the stroke of a hammer driving in nails have much in common. Far different employment is found for the smooth bare tail of the sleepy-eyed opossum. When taking her children for a ride on her back, the mother opossum curves her tail forward so all the riders can wind their tails around hers and, thus, like inverted subway strap-hangers, cling safely.

To anyone who has had experience in the woods, the sight of a skunk with its tail cocked at a certain angle is a warning not to be disregarded. Tail-signals of other kinds are likewise familiar. On forest ponds, the beaver brings its wide, flat tail down on the surface of the water with a slap that echoes far through the woods. It is a warning-signal that sends all the other members of the colony diving into the safety of the pond. However, of all tails that provide warning sounds, the most famous is undoubtedly that of the rattlesnake. The high whir of the horny rattles at the tip of its tail is a look-out signal understood by every creature of the wild.

Although the mouth of the western gila monster, like that of the rattlesnake, contains poison, its tail serves a far different purpose. It is a kind of living pantry. In it the lizard stores up food in the form of fat for a time of need. In the case of the scorpion, it is the tail and not the head that is poisonous. This tail ends in a needle-sharp tip that is jabbed into a victim to inject the venom. Not far different is the tip of the tail of the honeybee and wasp. Their stings, like hypodermic needles, inject a milder venom into the body of a victim. The tail of the parasitic Ichneumon fly, a relative of the wasp, has an even more sinister application. It ends in an ovipositor, or egg-placer, which operates something like an old-fashioned corn planter to deposit eggs in the tissues of caterpillars. These parasitic eggs hatch into larvae that devour their host. Another, more pleasant, application of a tail in relation to eggs is found among the crayfish. Here the eggs, or crayfish "berries," are fastened by a sticky secretion to the underside of the tail. They are carried about and protected in this manner until they hatch. Lobsters have a similar practice.

In numerous ways, tails are lifesavers. The mole, tunneling in the darkness of its underground burrow, depends upon its extremely sensitive little tail, thrust out behind it like a lightning rod, to warn it of danger from the rear. The Luna moth, fluttering about in the dusk of summer evenings, trails its long ribbon-tails behind it. They are thought to form a sort of matador's cape, attracting the attention of enemies so they direct their attack farther away from the vulnerable body of the moth.

A few years ago, a noted New England ornithologist told me of something he had seen with a friend in Florida. On a field trip, one day, they came upon a water snake in the process of swallowing a smaller garter snake. The victim (Continued on page 386)



This earliest published drawing of an anglerfish appeared in Pierre Belon's *De Aquatilibus* in 1553. It is really a caricature. It is a scowling, steel-trapped-mouth creature that the author called a sea frog.

One by-way that Dr. E. W. Gudger, eminent ichthyologist of the American Museum of Natural History, has long enjoyed exploring, is that of early illustrations of fishes. He presented some of the results of these excursions in an article, "Unusual Finny Heads and Faces", in the June-July, 1946, issue of Nature Magazine. He reserved for special attention, however, the anglerfish, a jolly fellow if we may accept the renderings of fish artists of the past.

The Smiling Anglerfish

By E. W. GUDGER

DANGLING its lure before its cavernous mouth, the anglerfish, a flat and flabby fellow, dwells on the bottom of the ocean. There it is a highly perfected, animated fish trap that may, in European waters, be as much as four feet long and weigh seventy pounds. *Lophius piscatorius* is its name in ichthyological circles. Photographs of the live angler do not seem to exist; at least I have been unable to find one. But artists have drawn this tadpole-shaped fish, whose head is out of all proportion to its body, and mouth out of all proportion to its head, and portrayed it as a smiling fellow remarkably resembling a happy person.

Granted certain license, fish artists nevertheless have justification for giving the angler some human resemblance. A dorsal ridge, nose-like, divides the bright eyes, which are high on the head. The mouth is shortened fore and aft, and widened right and left, while the lower jaw juts out like a chin when the mouth is open.

Aristotle, some 2200 years ago, called this fish "the fishing frog," and described it. "He fishes with hairlike filaments hung before his eyes," wrote the father of natural history. "On the end of each filament is a little knob, just as if it had been placed there for bait. He makes a disturbance in sandy or muddy places, hides himself and raises these filaments. When the little fish strike at these, he leads them down with the filaments until he brings them to his mouth."

Aristotle's account was doubted for 2000 years because no one had seen and described an anglerfish angling with its lure. But in 1929 a specimen in the tanks of the

This was the first smiling anglerfish done in color for Bloch's great work, *Ichthyologie*. The wide-open mouth shows the great armament of teeth. The circular eyes are splendidly drawn. Note the marked disparity in size between head and body.

In 1554 came Salviani's anglerfish, close to being a real portrait. It was painted, engraved on copper and printed in Salviani's house in Rome. Notable are the huge head and small body; the wide, smiling mouth with the lure hanging in it; the large staring eyes and large pectoral fins.

This is the smiling anglerfish according to Gunther, and shows a tiny angler, compared to the European kind, caught on the Challenger Expedition. The profile lappets, or tags, mimic seaweed and effectively hide the finny fisherman when it is lying on the bottom of the ocean awaiting its prey.

Marine Biological Station at Port Erin, England, performed just as Aristotle described, and other fish students have seen the same actions.

Lophius is a varacious fish eater, but has another individualistic character in this connection. Most fishes digest as they feed, but the angler's digestion is delayed, making a study of stomach contents easy. One anglerfish was found to have some seventy-five herrings in its stomach, and these were in such pristine shape as to be sold in the market. So this fish has a large storage space in its stomach, which may be why it looks well-fed and happy.

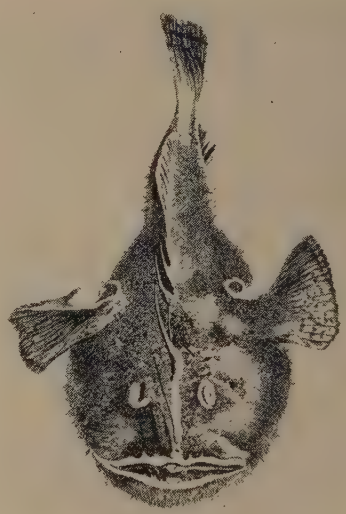
Artistically the anglerfish had not acquired a smile when the first published drawing of it appeared in 1553 in Pierre Belon's *De Aquatilibus*. The author called the fish *Rana marina*, the sea frog, and the drawing shows the pectoral fins as thick-fingered hands — the left with six fingers. This was a caricature, but it set the pace for the drawing by Salviani, which appeared in 1554. This was the first portrait of the open countenance of a smiling anglerfish, and comes close to being a true presentation of the fish.

Two-hundred and thirty-two years after Salviani, the learned Berlin physician, Marc Elieser Bloch, included in his monumental *Ichthyologie* an angler with a broad and friendly smile.

With one exception the anglerfishes pictured here are of *L. piscatorius*. The exception is the picture of a different species taken by the Challenger Expedition off Admiralty Island, north of New Guinea, and described by Gunther in 1880. This fish was only eight inches long. The most striking feature about it was its prodigal abundance of decoration. Evidently the fish lies on the bottom, snuggled in fronds of seaweed, mimicking its surroundings. The much-divided lappets or tags on its body wave to and fro alluringly with the motion of the water or with the fish's breathing.

For some reason O. Abel included the anglerfish in his work on ancient life published in 1912. His artist "did himself proud" in his drawing, copied from Gunther. Here are the large dorsal eyes, and, between them, a pronounced nose. The upper lip structures are less emphasized, but lower jaw, teeth and lappets are clear. Not only does this drawing portray a smiling *Lophius*, but, by using a little imagination, one can see an amiable New England sea captain of the old school, with a firm but kindly eye, a wide smile, and a fine circle of luxuriant, throat-embracing chin whiskers.

A more recent drawing of the anglerfish used by Abel in 1912. With a bit of imagination one can see a portrait of an old-time New England sea captain with a wide smile, a kindly eye, a broad nose and throat-encircling chin whiskers, the lappets emphasized.



Pennant portrayed this dissipated anglerfish in 1812. It seems badly to need a bath and shave. But of this drawing, Cuvier and Valenciennes, French ichthyologists, assessing all anglerfish drawings critically, said that "this drawing leaves nothing to be desired."

Many other drawings of the anglerfish could be reproduced, and they all include the smiling mouth. However, the selection of pictures can best be rounded out by presenting one from the pen of Thomas Pennant. This one looks like a drunken and dissolute angler, just recovering from a prolonged binge, and badly in need of both bath and shave.

Just why artists have consistently given the anglerfish its smile, or humanized its face in their drawings, it is difficult to say. Physically, of course, they had reason born of the structure of the fish's head. Asking for license comparable to that taken by the artists, I might arrive at a psychological conclusion that the angler smiles because he is so well equipped to catch his prey, and to store some away for the next meal. In other words, it is a well-fed and happy fish —why not grin about it?

Furthermore, evidence on this point is supplied by another observer of another fish. In 1933, William Beebe brought back to the old New York Aquarium from Havana a related pygmy angler, *Antennarius scaber*. This little fisherman used its angle or lure much as does *Lophius*. The photographs illustrating the fishing show the angler with his fins all folded while the angling is going on. When the prey has been ingested the midget spreads all his fins and displays his colors. Beebe's last photograph shows this fine fin-display.

Since our exploration of anglerfish art deals with "unnatural", or psychological, matters, as well as natural, or anatomical, ones in this fish, our brief discussion of *Lophius* seems appropriately to end with the limerick—

There was a young lady from Niger,
Who smiled as she rode on a tiger,
They came back from the ride
With the lady inside,
And the smile on the face of the tiger.

The mountain beavers, like beavers, are rodents, but there the resemblance ends. In appearance they look like half-grown woodchucks, but they have a coat of finer hair and a tail less than an inch long.

Our Mountain Beaver of the West

By J. ALDEN LORING

Photographs by H. E. Anthony

On the Olympic Peninsula, in the Cascades from British Columbia to northern California, in the coast ranges of Oregon and northern California, and in the Sierra Nevada of northern California, lives a peculiar mammal usually known as mountain beaver. Sewellel, really the Chinook Indian name of the robe made of their skins, and showt'l, English rendering of one of the native names, are mainly book-names nowadays.

Lewis and Clark were the first explorers to meet with this animal. They encountered it in the shape of a robe made of its skins, in the possession of Indians near the mouth of the Columbia River in Oregon. The explorers called it showt'l but did not give it a technical name. Rafinesque, in 1817, described it as *Anisonyx rufa. Aplodontia*, the generic name now universally used, was established by Richardson in 1929. These little animals, like beavers, are rodents, but here the resemblance stops. In appearance and build they resemble partly-grown woodchucks, but the hair is finer and the tail is less than an inch long. They are hardy little animals, able to withstand the rigors of winter without hibernating, and live on tender herbaceous plants and shrubs. They are full of grit and pluck, and, when cornered, stand their ground and fight, being able to inflict severe bites with their long, sharp incisors. Until lately, little was known of their habits, and even today much regarding their behavior is unknown.

Dr. Suckley, in writing of them long ago, said: "This animal burrows extensively in the ground. It chiefly frequents spring heads in rich, moist places, and is found as far up as the dividing ridge of the Cascade Mountains, and on both sides of the divide. I noticed their burrows in 1853 at the top of the main Yakima Pass. Near their abodes were small bundles of herbs or plants cut with nicety and laid out on logs to dry or wilt." Whether this drying of plants is for food or bedding, and the question of the climbing ability of the animal, have been discussed by several writers. However, the fact that the animal does "make hay", as does the unrelated pika or little chief hare, would seem to be the interesting point. E. A. Preble reports observing, in what is now Crater Lake National Park, quantities of food-plants, laid on exposed parts of rocks or logs near the animal's burrows, drying in the sun, and bunched in convenient mouthfuls just as they had been laid down by the provident animal. As to climbing, *Nature Magazine* has published a photograph of a denuded young fir

that had been climbed by a mountain beaver (Sept. 1926, page 166). Here the climbing would be facilitated by the stubs of the several limbs, but the mere ability to cut off the limbs, several inches from the trunk, itself denotes a definite degree of dexterity in tree climbing.

I was surprised, while collecting at Emerald Bay, on Lake Tahoe, California, in June, 1897, to learn that three old mountaineers, who had lived in the region since early days, had never seen a mountain beaver; one of them thought they represented a cross between a "whistler", or mountain woodchuck, and a beaver. Yet, back of the hotel and only 300 feet higher, I found runways and burrows plentiful. Here they lived in a tract that had the appearance of having been swept by a snowslide and denuded of its trees. It was now thickly overgrown with willows and alders, with occasionally an open grassy plot. Several small snow-fed streams had become miniature torrents, and had furrowed their way in the rich earth, helping to afford congenial habitat for a colony of mountain beavers.

This captive mountain beaver was trapped for photographing. After several determined efforts to escape it gave up and went contentedly about eating a tender shoot of "elk-brake", a favorite food.

During the afternoon of my arrival, while climbing through this brushy area, my attention was attracted by the runways and footprints of these animals. In places the bank was honeycombed by their burrows, some of which were filled with water, while others entered the ground abruptly. I was led to believe that the animals, while traveling, took to the bed of the streams, wading through the water and swift current, and upon reaching a fall or place too steep to ascend would make a detour. In some places their runways connected streams that flowed close together, while others made sharp turns, and still others left the streams and led around waterfalls or boulders. They wound in and out among the rocks and grassy plots alike.

At intervals along the banks of the brook, where depressions had been washed out, were landing places that the animals had established. Here the grassy earth was matted where they had rested or leisurely eaten their food.

The burrows that I found here did not seem to be entrances to their homes. At the foot of the mountain, in comparatively dry ground, and among a thick growth of willows, I found a burrow that was undoubtedly the entrance to a nest. In a similar place, a hundred yards away, was another one. Nearly every night fresh earth was thrown out from these entrances, which did not enter the ground abruptly but tunneled several feet and then gradually descended. I frequently found leaves and the tender ends and shoots of bushes lying about where the animals had left them after eating, but did not find food definitely laid out to dry. Although I noted many bushes about their abodes that had small twigs cut, I assumed that it was done during the winter when the snow was deep and the animals were able to reach them in that way.

Coues and Allen, in their *Monographs of North American Rodentia,* quote Dr. J. G. Cooper as saying: "A young man who had kept school at Astoria, told me that the children sometimes caught them [mountain beavers] about the schoolhouse, where they burrowed, and that they could be caught by running after them, as they did not run fast. When taken they did not offer to bite, and ate vegetable food readily."

The following notes on the habits of these animals, and the illustrations, are paraphrased from H. E. Anthony's report on the *Habits of Aplodontia,* published by the American Museum of Natural History. He doubts that the animal is strictly nocturnal but concludes that it can rarely be seen during the day. Although runways were daily visited and evidence of activity was manifest, he was unable to see one. A healthy and uninjured individual furnished most of his information on behavior. Because of the difficulty of actually observing the working animals, and

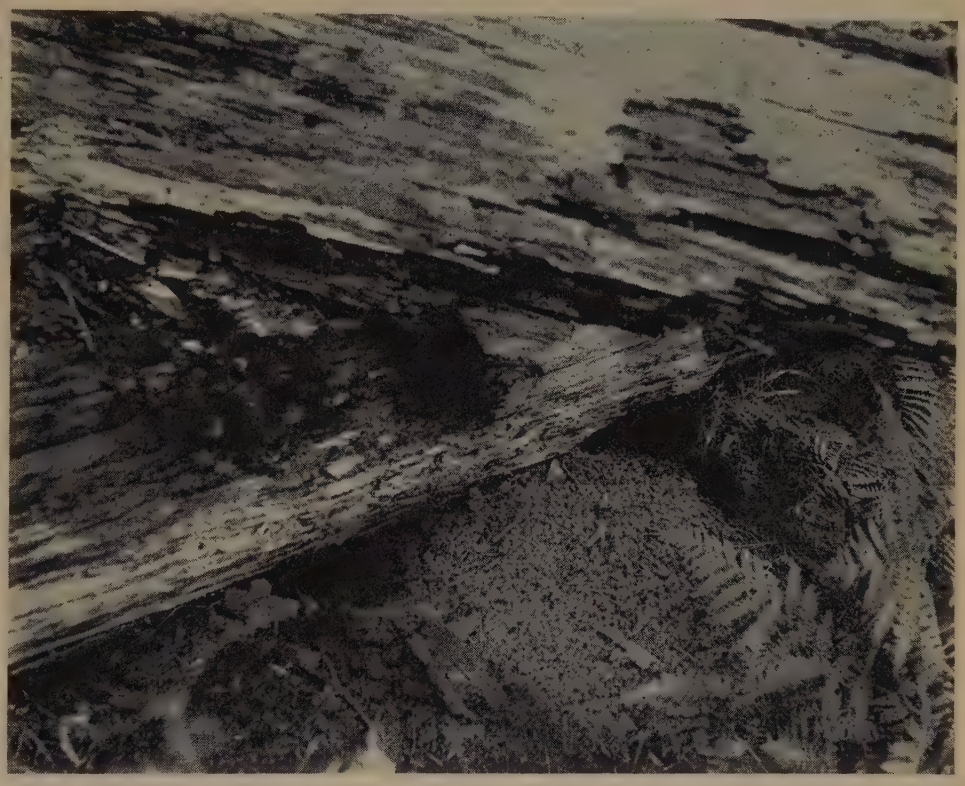
because of the great labor involved in excavating the underground workings, which was a practical impossibility about Tillamook, some of the conclusions drawn are conjectures only, but conjectures that appear to be well supported by what data could be gathered. The animals were found most frequently where vegetation was rankest and where moist, loose soil facilitated digging. In such a place, large holes and piles of earth thrown out from the burrows are generally numerous and indicate the presence of several individuals and a marked degree of activity.

A series of runways seemed to be inhabited by a single family, and there was no evidence of sociability as, for example, with prairie-dogs or meadow-mice. The amount of earth thrown out of the numerous runways is indicative of the activity of the individuals. Traps set in runways were usually successful the first night, but others set in the same immediate vicinity were likely to yield nothing for several days. This lack of success could not be due to caution by the animal, for it exhibits no inherent cunning, being easily caught in exposed traps. Also, no fresh dirt would be thrown out, nor were there any fresh-cut leaves or green twigs to be seen. All evidence pointed unmistakably to a depletion of the colony.

The subterranean workings were seen to be simple. There were one or more long, main runways opening to the surface by short side-burrows at frequent intervals, with a diameter of not over six to ten inches, depending on the nature of the soil, and the floors of the tubes were devoid of loose dirt. Generally, the runway would follow any natural advantage such as fallen logs, and here the burrow was often shallow, the log serving to cover it. In such spots the floor of the runway would be well trodden down, and in crossing from one log to another would become a mere path, but with vegetation and small obstacles removed. Exits to the surface from a deeper runway would be direct. Loose dirt would be pushed out just far enough to be out of the way. Main runways might be more than a hundred feet long. The depth below the surface might be eight inches to a foot. Nothing could be learned of the nest or home chamber of these animals.

The dirt is handled much as with the pocket gopher, masses of loose earth being pushed ahead by the chest and shoulders, the broad, blunt head being used to shove aside the dirt. Where large quantities of earth were being excavated nightly the method could be detected by the imprints in the loose piles of soft earth. Here was a fan-shaped dump, in miniature like those at the entrance of underground mines, where the dirt has been pushed to the edge, and allowed to roll down a foot or so to the ground level. The burrows always opened out to utilize the down grade of any little slope. Over the top of the dump could be seen a depression where the animal pushed along his load of dirt, and often the modeling showed the imprint of his blunt nose where he had pushed aside the pile to make more room for his load of soil to pass.

When caught in a trap without serious injury, the animals are very pugnacious, and if two are brought together they fight ferociously—and bite fiercely at sticks or any object thrust near them. It seems that under ordinary circumstances this pugnacity would keep the inhabitants of a series of burrows few in number. Their resemblance in behavior to pocket gophers, under similar conditions, indicates that the aplodontia may have the same surly home life.



Entrance to a burrow of a mountain beaver, showing the manner in which the dirt is pushed out. Usually the burrow is so placed that the dirt, once out, will fall down a slope below the entrance.

One caught in a hold trap, but uninjured, was found the morning of July 28, and was kept alive to observe his habits. He was very aggressive while in the trap and when brought near another captive, also uninjured, after the first tussle he created such a respectful attitude in animal No. 2 that the latter strained at the chain to keep out of his reach. They were separated before either had (Continued on page 386)

The Isle of Boobies

By ALEXANDER F. SKUTCH

Photographs by the Author

★

Sitting on its "nest" in the sharp-edged rock, a downy young booby intently eyes the camera.

★

DOUBTLESS every lover of birds who has fallen under the spell of such charming books as Kearton's *Island of Penguins* or Lockley's *Shearwaters* has, like myself, formed the wish that he might make a long sojourn on some remote islet where sea fowl nest. With few exceptions, it is only on small, isolated islands that one finds fairly large birds breeding in great numbers in nests built on or near the ground, where they are easily approached and studied. Extensive land areas support so many predatory creatures that birds must conceal their nests singly in the woods and fields, or, if they breed in colonies, place these in high tree-tops, on forbidding cliffs, or in other situations difficult of access.

But my bird-watching long ago led me into the tropical mountains, where there is a far greater variety of birds than can be met on any islet, although their nests, hidden away amid the tall forests and dense thickets, are not easily found. Only twice have I had the good fortune to land upon the island homes of sea birds, and each time for a few hours only. Yet each visit was a memorable occasion, for on such an islet the enthusiast may crowd into a morning more bird-watching and more bird photography than falls to his share during any week in localities less densely populated by feathered creatures.

In March, standing upon the high northwestern point of Columbus Island off the northern coast of Panama, our negro guide pointed out Swan Cay, a high, dark mass rising above the blue waters of the Caribbean, and told us that the boobies had begun to lay their eggs upon it. But it was my first year in Central America, there were innumerable other things to occupy my attention, and it was the beginning of June before I could realize my long-standing desire to visit a breeding place of sea fowl.

At seven o'clock in the morning our launch left Bocas del Toro and turned westward along the northern or outer side of Columbus Island. As we rounded Norte Point, the isolated limestone mass of Swan Cay, rearing its head 180 feet above the sea, loomed before us like a grim, towering castle. Soon we

The whole surface of the Cay, save only vertical expanses of naked rock, was covered with luxuriant tropical vegetation. Downy white young boobies appear on the vine-clad rocks in the foreground.

could discern a smaller islet close beside it; and as our vessel drew nearer a third diminutive islet lifted its head above the horizon between the first two. Finally, as we chugged still nearer, it became evident that these three unequal islands were all parts of the same ragged mass of rock, joined together by low isthmuses, which, until then, had been concealed below the horizon. We dropped anchor in the lee of the Cay and went ashore in the skiff, which we pulled up on one of the few bits of sandy beach between the rocky walls that rose from the water's edge. As we stepped ashore, the air above us was filled with white-bellied boobies, *Sula leucogastra*, in mature and juvenal plumage, frigate birds, red-bellied tropic birds and gray-breasted martins, circling about in wonderment over this invasion of their island domain.

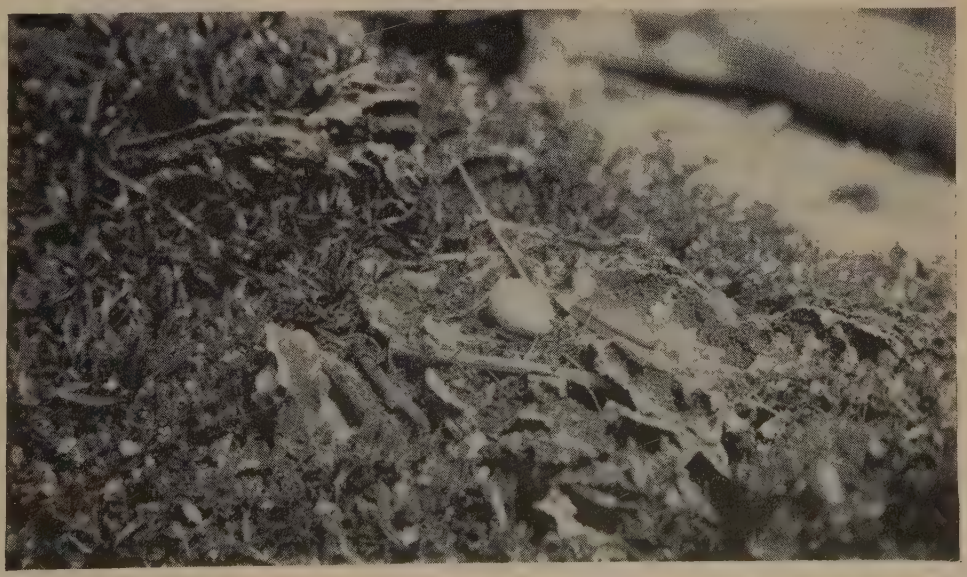
I began my exploration of the islet by climbing laboriously up to the top of the main pinnacle for a general survey. Among the lush vegetation clinging to the steep slopes was a big, shrubby nettle that blocked my way and stung my hands as I brushed past it. Reaching the flat, table-like summit, I found that it supported a scrap of lofty forest, so like that on the neighboring mainland that large pigeons nested here; and leaf-cutting ants traveled their well-worn trails, waving irregular pieces of green leaf like parasols above their backs. Through gaps in the high canopy of foliage, I caught occasional glimpses of the frigate birds, boobies and tropic birds that circled over the island. A few young boobies sat in their nests at the top of the seaward face of this high mass, but by far the greater number of them were to be found on the two lower, treeless rock masses that I overlooked. So I scrambled down again to visit the heart of the colony.

The coral limestone that formed these humps had weathered most irregularly, leaving sharp, angular projections with roughly pitted surfaces. The deep fissures in the rock were so completely screened by a great profusion of fleshy *Cissus* vines, which everywhere covered the surface, that I fell into several before I was aware of their presence. Rock crabs, of colors too varied to describe, in patterns of bewildering intricacy, scrambled over the cliffs among the nesting birds; and hermit crabs scuttled along in their borrowed shells. Crested basilisk

The first sign of the approaching maturity of the downy white nestling booby is the appearance of dark gray feathers on the shoulders, wings and tail.

lizards, whose long toes on the hind-feet enable them to run swiftly over the surface of the water in bipedal fashion, were abundant on the open parts of the islet. Coconut palms grew in the soil that had collected at the base of the principal rock mass, some of them rooted twenty feet above the sea; and these interested the boat crew while I gave attention to the birds.

The boobies nested in little, soil-filled depressions



The boobies' white eggs lay in shallow depressions in the fractured and pitted limestone, or in a small circle of ground bare of vegetation. Rarely a few sticks had been placed around the "nest".

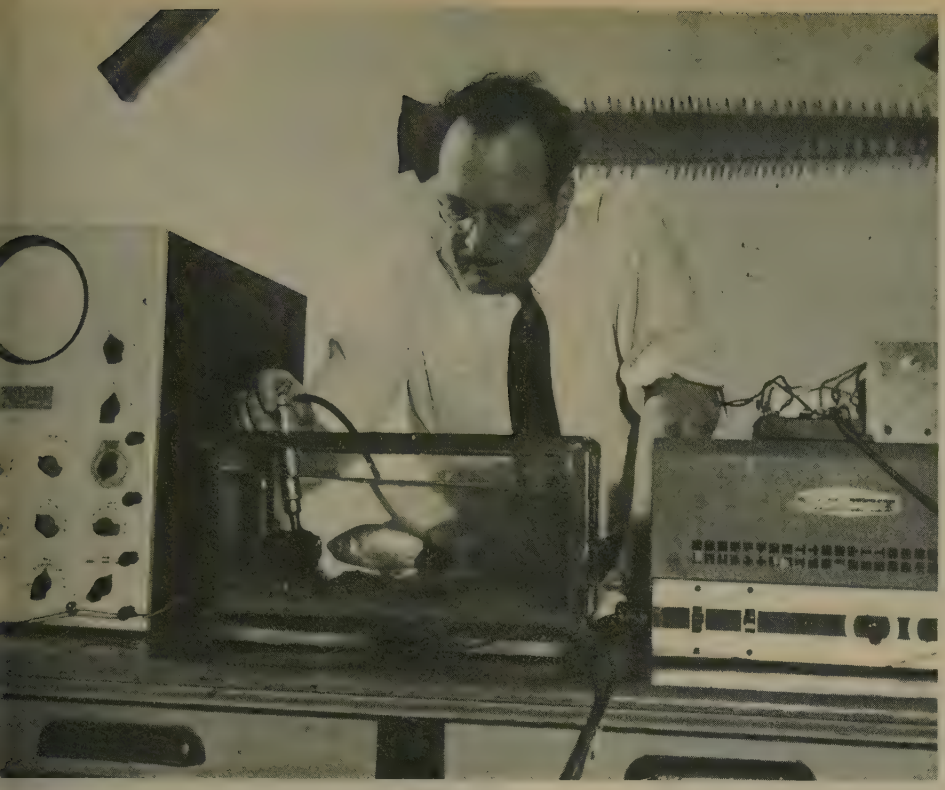
Young boobies in neighboring nests differ greatly in color, but it is all a matter of age. The bird at the left is covered with dark feathers and almost ready to fly; the downy white youngster at the right is just beginning to acquire feathers. Usually nestlings fought if pushed too close together, but these two have apparently decided to ignore each other's existence.

in the rock, or merely on a level part of its surface. The nests were for the most part to be distinguished from the surrounding area chiefly by the absence of vegetation from the narrow circle where the parent birds sat. In some instances, a few sticks had been placed around the spot where the eggs were laid, but never enough of them to make anything that even by courtesy might be called a nest. Now, on the first of June, a single booby, who held a stick in its bill as I approached, incubated its solitary white egg, which rested on the bare earth. Another booby stood over two newly hatched young, and in its intentness in gazing at me stepped on them with broad, webbed feet, but apparently did them no harm. This was the only bird with two nestlings—although this species is said generally to lay two eggs in a set—and these were the only very young nestlings that I saw. At their tender age prolonged exposure to the sun might have been fatal, and their parent bravely stood its ground to shade them, while all the other adults circled around overhead or plunged arrow-like into the sea for fish, leaving their offspring unguarded. Since male and female boobies are much alike in appearance, I could not tell the sex of this devoted parent.

The half-grown boobies were covered with soft, thick, pure white down, which continued to cover them until they were nearly fullgrown. The bare skin at the base of their bills, in front of and below the eyes, was of a leaden color, and their feet were dirty yellow. Nestlings somewhat older had sprouted wing and tail plumes, which were dark gray and contrasted strongly with the white down that continued to clothe the body. Still older nestlings, who had acquired their plumage, were gray almost everywhere; but the gray was of a lighter shade on the lower breast and belly. White and dark gray nestlings in adjacent "nests" sparred at each other when they were driven too close together by my approach. Many of the dark gray young birds were already on the wing and circled above the island in company with the adults, from which they differed chiefly in that their bellies were gray, while those of their parents were white.

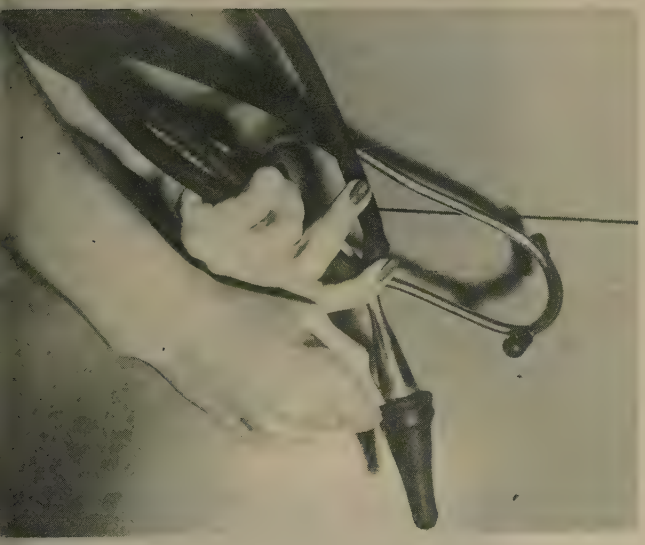
Upon my approach to a nestling booby, it uttered loud, hoarse cries of alarm, and at the same time backed with spread wings to the farther side of the bare circle of ground that represented its nest. As I drew nearer, its cry grew louder, until, with bill opened to its utmost stretch, it delivered a continuous *ah-h-h-h*. It did not restrict itself to vain cries, but made vigorous attempts to defend itself, flapping its widespread wings and delivering spirited blows with its bill. It would attempt to bite my hand, my shoe, or anything else I presented to it. When one of the nestlings, in backing away from me, came too near another, it was greeted with pecks and bites, which is repaid in kind. This made me feel less like an intruder, for I perceived that I was treated exactly as another booby.

The red-billed tropic birds, *Phaëthon aethereus*, nested on ledges, and particularly in sheltered niches in the rocky cliffs. Many of the young were nearly fledged, and when taken in hand uttered deafening screams, at the same time attempting to inflict bites that it was wise to avoid, and struggling desperately to free themselves. "Feathered bulldogs," the British vice-consul, with whom I afterwards spoke at Bocas del Toro, called them. Before I was aware of what they were about, the boatmen had taken many young tropic birds from their nests and carried them to the landing place, where they created a deafening uproar. I commanded the men to return the fledglings to their homes. They were accordingly dispersed; but I was by no means sure that each (Continued on page 386)



Lowering a waterproofed microphone into the fish tank, Dr. Christopher Coates prepares to record whatever sound the occupant of the tank may make. The mike is connected with a sensitive recording instrument known as an oscillograph, which records the sound waves stirred up by the finny dwellers in the water.

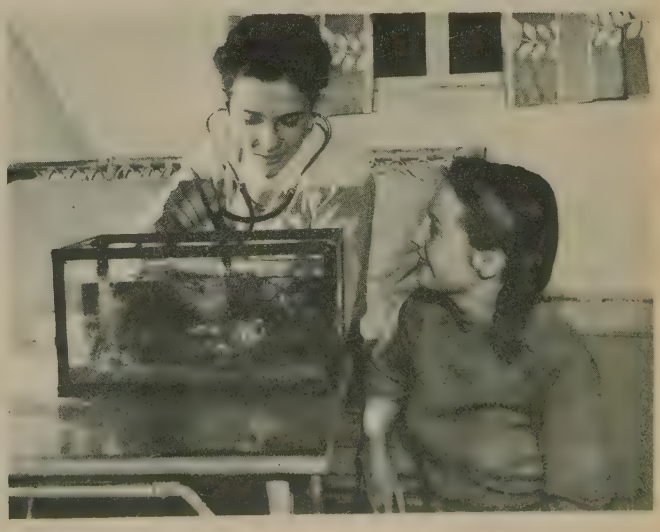
Photographs from Three Lions

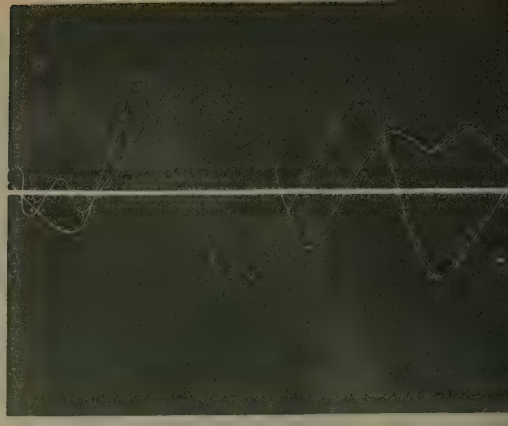


rubber nipple slipped over the tube of a stethoscope, with a rip of tape over the end of the nipple, make an effective listening post, as is shown at the right, below.

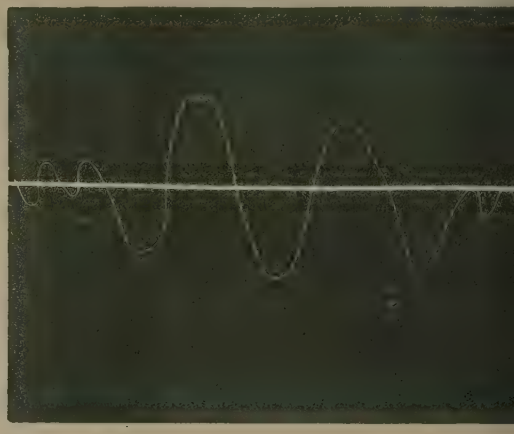
Fish "Talk"

USING a waterproofed microphone and an oscillograph, Dr. Christopher Coates of the New York Zoological Society Aquarium has been listening to and recording fish "talk". He has found that fishes not only make sounds but that these seem to be varied in pitch and intensity according to the mood of the maker. Excitement produces loud and rapid noises. Loud and steady sounds come when fishes are feeding. Something like a purr comes when a fish is at ease. Usually the fish's teeth, ground together, produce the sound, although other fishes may blow air from a swim bladder to produce something like a croak. Other studies of fish sounds are going on at marine laboratories and in a field that has been little explored. Some day we may be able to compile a finny dictionary of fish "talk"

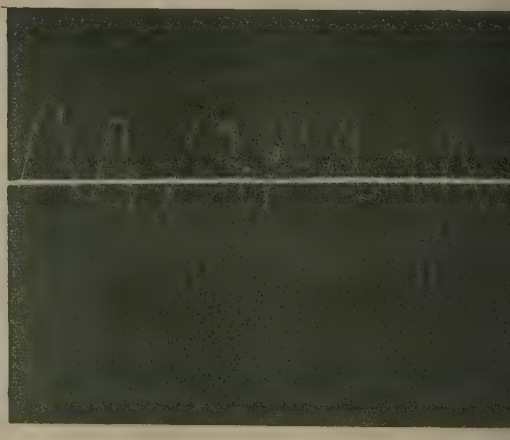




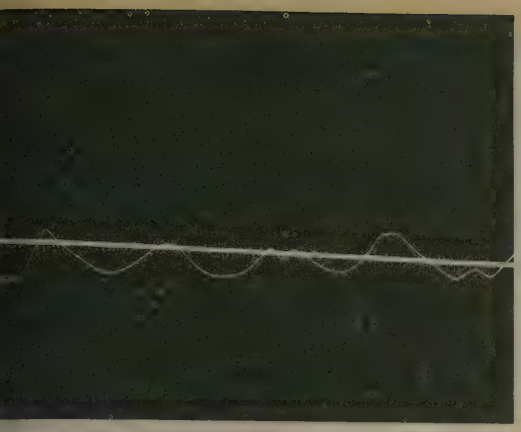
The boxfish at the left was prodded a few times with a pencil and produced an agitated, uneven curve on the oscillograph. This seemed to indicate the fish's anger and the sounds uttered were definite grunts.



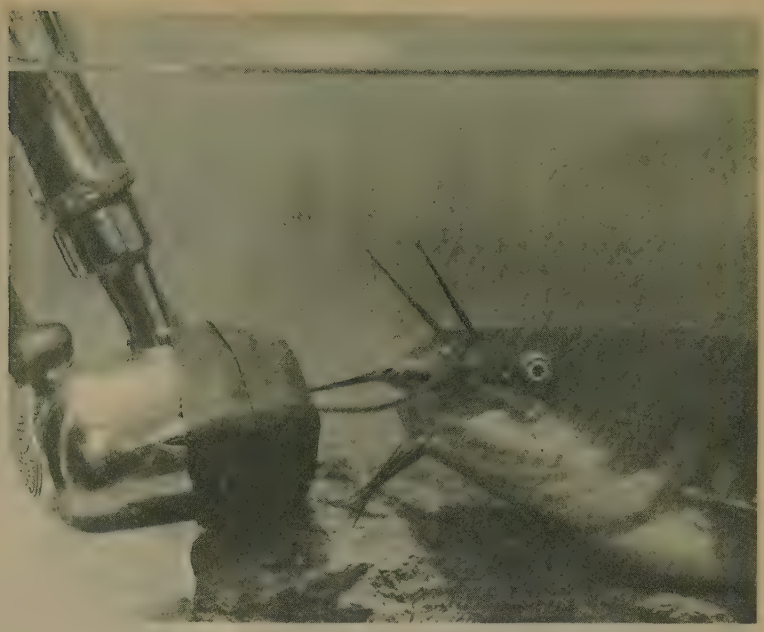
An interesting test was made with a pair of "kissing" gouramies, a big-mouthed variety of tropical fish from Malay. The recorder showed the "smacking" sounds they made.

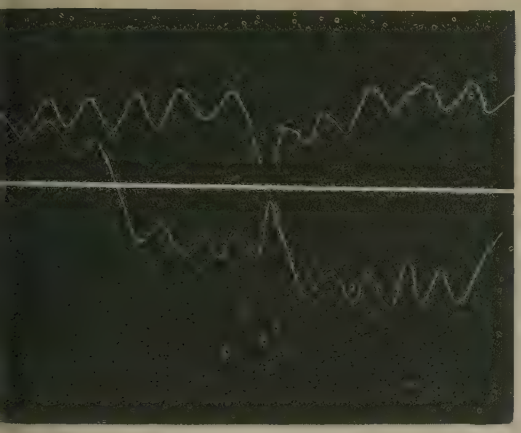


The goldfish is fed with an eyedropper to discover the sounds made. The oscillograph reflects the outside influence but registers a steadier line than with the angry boxfish.

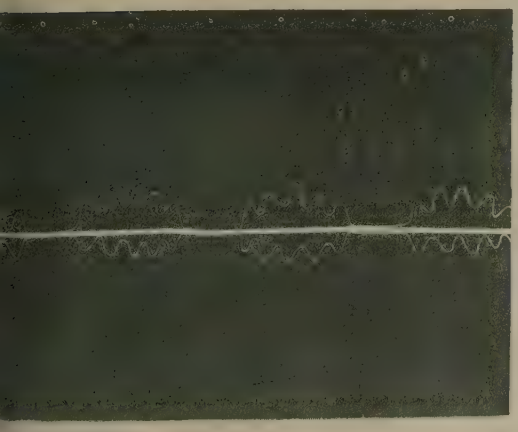


This catfish is enjoying a submarine siesta and is undisturbed when the microphone is carefully lowered into the tank to discover what sound, if any, a somnolent fish produces. There is a sound, but an even and subdued one.

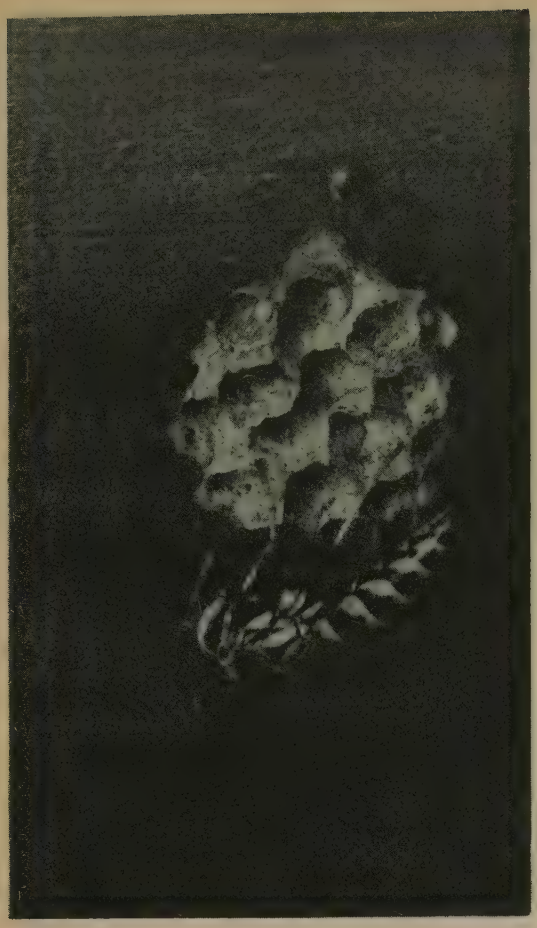


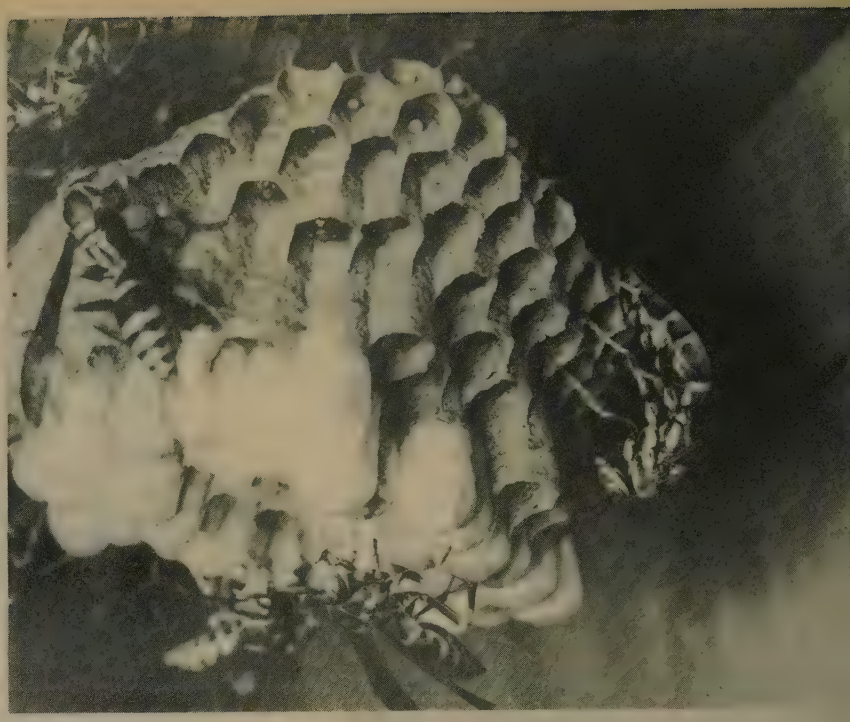


Quite a different effect on the oscillograph is found with another test of a catfish at east. In this case there is a definite purr, which shows up as following a sound pattern.



Although the catfish was so named because of its whiskers it also was found to purr.
The recording showed that the lines followed a pattern closely similar to those of a contented cat.



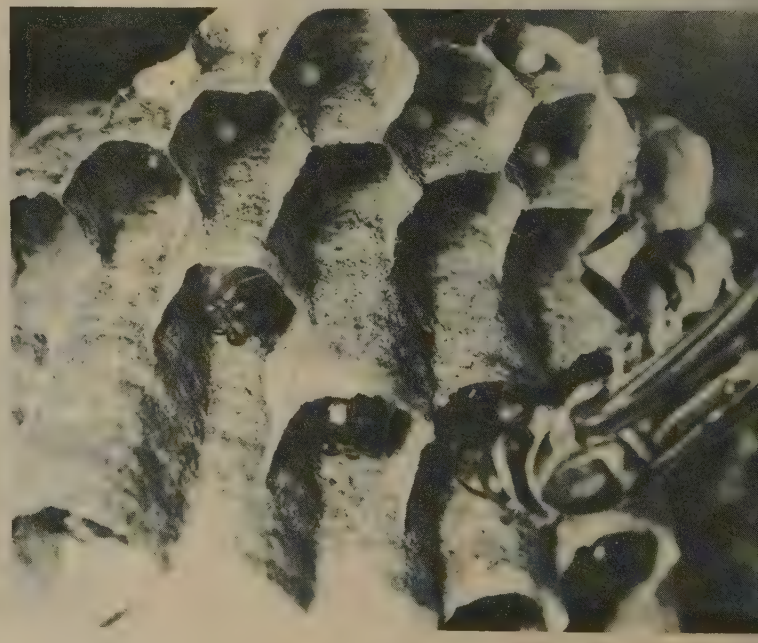


At the left the *Polistes* queen starts a new colony. She has already laid one egg, which can be seen upper, right. Above, the queen, at the right, is shown in the process of depositing an egg. The colony has grown, with some cells containing eggs, others larvae, and still others with the cells already capped.

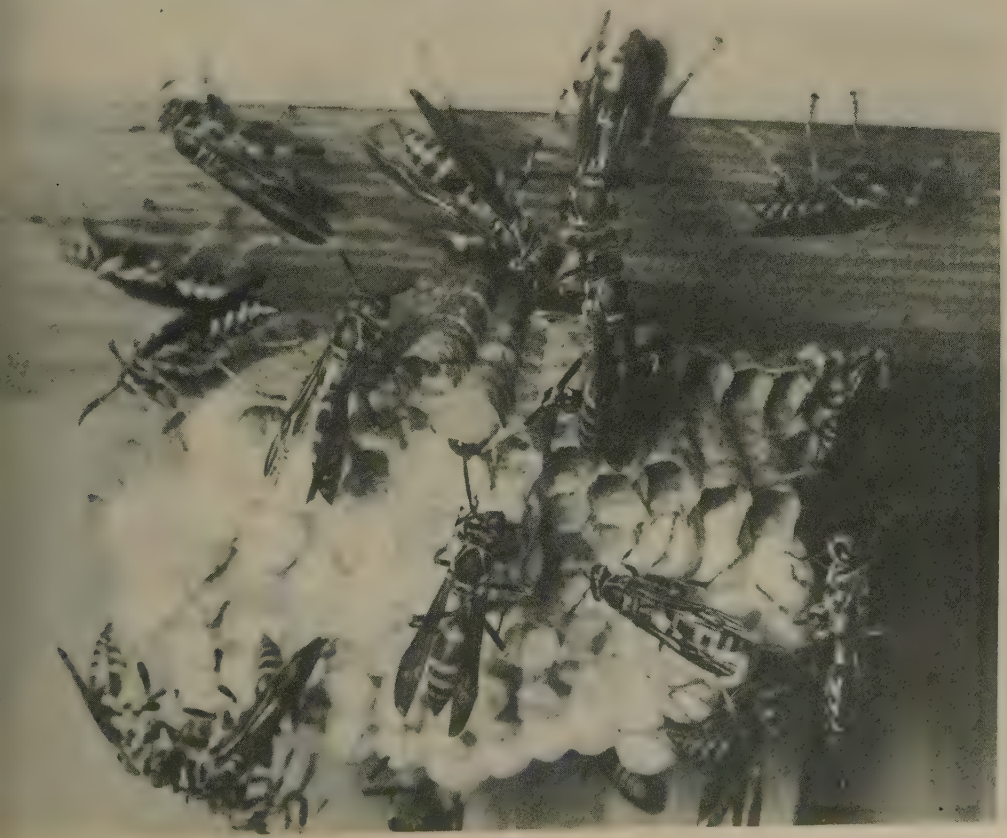
Spying on Polistes

Photographs by J. M. Hood

Polistes wasps belong to the family Vespidae and are cousins to the paper wasps and the potter wasps. There is only one genus *Polistes* with several species that are closely similar in habits of life. Their nests are all quite like the ones shown on these pages. These wasps may be closely observed with comparative safety provided the onlooker does not move too quickly and excite the busy insects. The queen differs little from the worker, as will be seen in the pictures. At the left is a worker *Polistes* that has found a rich source of food, a watermelon on which it is feeding, and from which it will take food back to the larvae in the home colony. At the left, below, is a worker in flight carrying food, which can be seen in the wasp's mouth. Below, the worker is feeding one of the larvae. This photograph shows several of the attached eggs, some of which are about ready to hatch into larvae.



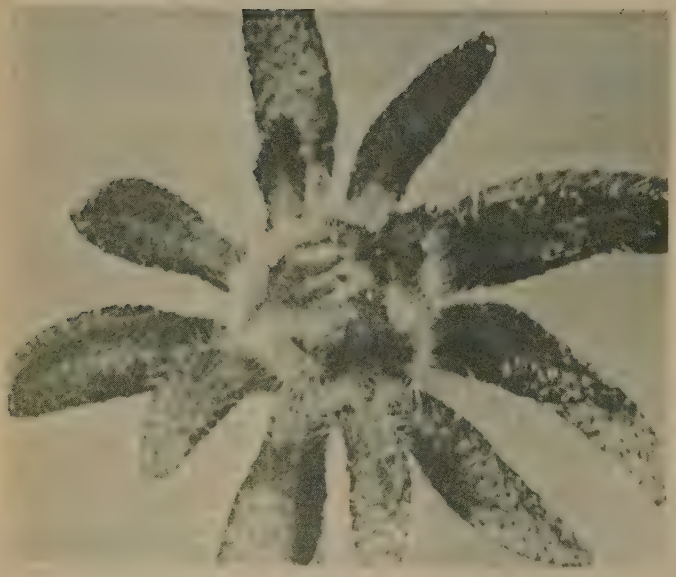
In the picture at the upper left are larvae waiting to be fed. This task is performed by the worker wasps, who also build up the cell walls as the larva grows and progresses to the point of sealing itself in with the silk caps that protect it while it pupates. Upper right, in the center cell, we see a larva well along toward maturity starting to put the silk cap on the cell. At the left the larva is finishing the silk cap. The interior of the cell is also lined with silk, which prevents the larva from drying out as it transforms into a pupa and finally emerges as an adult wasp. Below, the Polistes nest is a busy place, with the workers carrying on their various tasks in their life cycle.



Indications are that the *Polistes* wasps we know in the North have gradually extended their range from an original tropical habitat. Phil Rau, commenting on the fact that these insects in their relatively open homes can survive exposure to rain and heat, suggests that this may be due to their tropical ancestry and the fact that they encounter such conditions in their original warmer and moister climates. Dr. Rau has studied these wasps in Panama and notes the fundamental similarity between the nests found there in trees and the nests found in more northern climes, both in trees and attached to human habitations. The photographs on these pages were taken in Texas, and their intimate character indicates how easy it is to get close to the busy wasps without running much risk.

Photographs by Lynwood M. Chace

Black-eyed Susan is a common wildflower of the East, but it is really a westerner, having first come East mixed with clover seed. It has become so naturalized, however, as to be chosen as State Flower of Maryland. It is known to botany as *Rudbeckia hirta*. It is a biennial of dry, open fields. It is also known as cone-flower. On this page the photographer records four stages in the opening of this colorful wildflower in Massachusetts. First, on June 23, he photographed the bud. On June 28 the bud was beginning to open. On July 3 the petals had completely unfolded and stood upright, while three days later the petals had started to fold back.



More episodes in the life of the Black-eyed Susan. Above is the strong root system of the plant, a clue to the reason for its permanence in the wildflower community. Above, right, is the fully opened flower. Directly below we see the disk of the flower when it has developed into the seed stage and soon will be ready to carry on its cycle. Below, right, the disk cut in half to show the arrangement of the seed.

Moments in the life of a redwing blackbird. The mother perches on the rim of her nest, skillfully woven of dried grasses and sedges and suspended among strong, blade-like cattails. In the nest are three pale-blue eggs, laid on successive days and peculiarly scrawled, spotted and blotched with black, dark-brown and purple. The photographer saw the mother become suddenly excited, and spotted a king snake moving toward the nest. Taking wing, the male gave the alarm. Once the intruder was driven away, the redwings returned to their tasks. As time passed the eggs were hatched, and, from then on, the mother was kept busy trying to satisfy the insatiable appetites with insects.

Photographs by Charles W. Schwartz

As We See It

"Dam It!" They Say

PROFANITY is improper in a family journal such as this, but certainly we may be permitted a mild expletive when referring to recurrent dam projects that threaten National Parks, wilderness areas and other outdoor values. And when one of these proposals threatens Glacier National Park we are tempted to stronger language, for, we freely admit, Glacier is our particular pet.

Glacier National Park *is* threatened. The Corps of Engineers proposes to construct Glacier View Dam on the Flathead River in Montana. This would create an artificial body of water some thirty miles long and of fluctuating water level. The dam would flood a scenic area of 19,460 acres within Glacier National Park. Eight thousand of these acres are now covered with virgin forest. The flooded area would wipe out a major portion of the winter feeding grounds of the park's larger mammals.

Public hearings on this proposal were held in Kalispell, Montana, in late May by the Corps of Engineers. At that time testimony was given on both sides of the question. Opposing the proposal, the National Park Service was vehemently recorded against this invasion of Glacier National Park. In this stand the Service was actively supported by conservationists generally.

"Glacier is one of the few western national parks in which the white-tail deer is found," declared Newton B. Drury, Director of the National Park Service. "It is the only park in the northern Rockies in which this deer has continued in fair numbers. In 1947 it was estimated that there were 130 of them in Glacier. Wildlife experts report that flooding the North Fork area would result in destroying 70 percent of the winter range of the white-tails. It probably would result in extermination of the species from the park through over-use of the remaining 30 percent of the wintering area. The effect on the moose would be worse. Of the estimated population of 175 moose, it is believed that between 80 and 90 percent would be deprived of their chance of survival through the winter. According to best estimates, other losses would be 20 percent of the 800 mule deer, 20 percent of the 3300 elk, and about 70 percent of the heavy beaver population in this part of the park, where this animal has found a particularly favorable habitat.

"Here along the west side of Glacier National Park is one of the superb wilderness areas of the West. We are convinced that the purposes to be served by the dam are not of such pressing national importance as to justify the certain destruction of irreplaceable natural resources which are the property of the people of the Nation—present and future. The 'interested parties' in this instance, include all Americans who, whether they realize it or not, have a stake in the preservation of the few remaining portions of primitive America, as found in the national parks."

The impact of the proposed dam on the wildlife population of Glacier Park is important. The destruction of wilderness values, which we personally know to be everything that Mr. Drury claims—and more—is important, also. But of greater significance than either of these specific threats is the threat to the integrity of our National Park System. Such threats appear to be on the increase. The danger to Olympic National Park still exists; Kings Canyon Park seems to be another earmarked for invasion since it appears to be on the list of envious and ambitious special interests.

Our National Parks have been set aside to preserve for future generations certain areas of outstanding significance. They have been so reserved for the benefit of all the people, whose property they are. The National Park Service is the official defender of these areas—the agency that must plead the public's case. But the Service cannot do this alone. It is subjected to various pressures and influences inherent in our governmental system. So the hand of the Service must be upheld by individuals and organizations aroused to the conservation need.

Local hearings, such as that held in Montana, bring forth a usually overbearing support for exploitation. This is often political; often short-sightedly economic. The chamber of commerce type of viewpoint can see only jobs; the politicians, votes. Combining such testimony with its own delight in dam building, the Corps of Engineers can usually be depended on to recommend that the project be carried through. For the public and for the conservationist, however, there remains the Congress, which must approve legislation carrying the plan into effect and must appropriate money to finance it. This is a political year. Congressmen are particularly sensitive to the popular voice. It is imperative that conservationists should ask of their servants in the Senate and the House a statement of their views on the protection of National Parks in general, and such projects as Glacier View Dam in particular. Ballots can then be marked accordingly. Conservation knows no party lines, and electing conservation-minded men and women to the halls of Congress provides assurance of the safe future of our Nation.

A seed-head of blow-wives among a group of white *Chaenactis* in bloom. The unwanted parachutes of the blow-wives are difficult to keep out of the seed-bag in which one is gathering desired seeds.

Success at Seed-saving

By LESTER ROWNTREE

Photographs by the Author

One of the first things one learns when dealing with Nature is that she makes no concessions. You meet her on her own terms, or not at all. Unless you work with her she will have nothing to do with you. You can take it or leave it. And, as with all other phases of intimacy with plants, cooperation with Nature is essential to success in seed-saving.

The scarcity of many seeds, and the poor quality of some, drove many war-time gardeners to doing their own saving. Now that the immediate need is over, this work, in not a few cases, goes on simply for the joy of it. The passion for growing things gains force, and gardens become more individualized, so seed-saving becomes more and more vital. It brings about a closer bond between the man and his plants, and the sensitive grower soon finds himself building up an independent collection from his own selection, the while recording the special history associated with each strain.

To do intelligent seed-saving the start should be made when the first blooms appear. Take candytuft, for instance. Even a packet of "selected strain" will yield several shades of pink or lavender; some will be clear colors, others distressingly muddy. By roguing—that is, by weeding out the undesired colors—

Birds puncture the seeds of the *Garrya* and take out the liquid, and the seed, as well, leaving the lacerated tassels of this plant shattered.

danger of mixing the shades will be lessened and each year the bed of candytuft will gain excellence. This process requires a sharp lookout, for if the bees get busy on a newly opened plant of a bad color, that color may be carried to a choice one, and there is nothing you can do about it. The plant with the undesirable color should have been yanked out when the first unwanted flower opened.

Seed-gathering should be done in dry weather. If there has been a dew, wait until the sun or wind has dried it off, then advance with scissors or clippers, and with bags suited to the size and amount of seed desired. Paper bags will do if the seed is not fine and if it is soon to be used. Fine seeds, such as those of saxifrage, begonia and *Calceolaria*, should be put into a cloth bag of very close weave. The easiest seeds to gather are those contained in erect pods, for then the seed usually stays intact for a few days, while those of the fly-aways—the ones that are here today and gone tomorrow—are off with the first breeze. In order to catch them at all the plants must be visited every day.

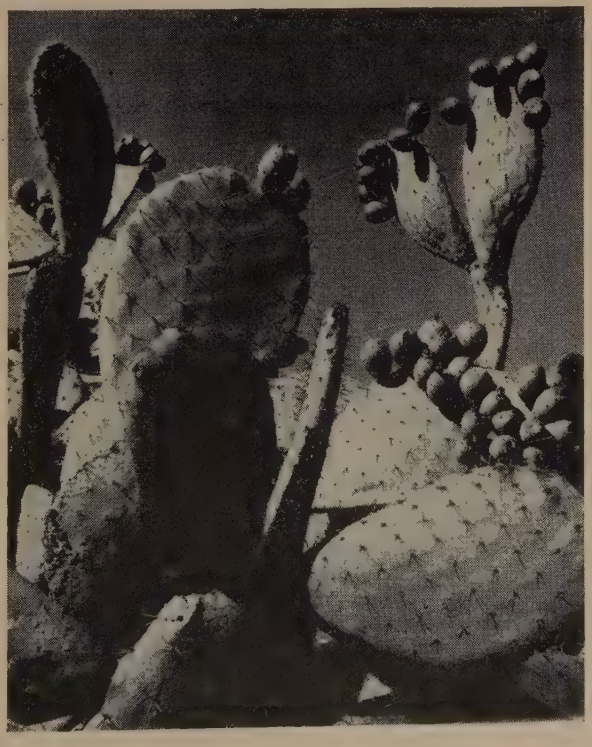
When the pod is brown, dry and beginning to split, you know the seed inside is ripening. When you see the little eyes at the top of true poppy capsules beginning to

The cobweb thistle is one of the loveliest of plants but its seeds are difficult to snare. A moth lays eggs in the flower, and her issue eats the seeds.

open, the dark, glistening seed of *Babiana* peeping out of its newly cracked, three-sided pod, and the narrow receptacles of *Godetia* and *Clarkia* breaking at the tip, then is the time to cut the vessels, together with an inch or so of stem, and pop them upside down in the bag. Tie the bag tightly and hang it in a dry, airy place until all seed has spilled. If you are going to sow the seed soon there is no need to put it in containers, but if it is to be kept until next year it should be enclosed in tin cans and kept in a room with an even temperature.

Cloth bags are not good containers for pointed seeds; they stick into the material and are hard to detach. Many daisies and some anemones and *Clematis* have pointed seeds, and they should be thrust into paper bags until cured. *Acaena* growers soon learn that it is not necessary to harvest the seed of these delightful little New Zealand ground-covers, for the prickly, clinging balls take the matter into their own hands, or claws, and come in on the gardener's stockings, so that all that needs to be done is to peel them off when getting into another pair. *Mesembryanthemum* seeds are easy, for the pods of most are deliberate, remaining closed until the first rains come, when they crack preparatory to discharging their loads. Use a cloth bag with fine mesh and keep it in a dry spot because these seeds, being used to heat and drought, mold quickly.

Then there are seeds, such as water chestnut, that must never dry out. If acorns get very dry they are useless, and when we send them away we must ship them in moist, but not wet, moss, for if the moss is too wet the acorns sprout en route. Seeds of some moisture-requiring plants are among the easiest to collect, and some will even ripen with the stalks in water. Cardinal flowers can be picked before the seed pods are fully enlarged, and, if the stems are kept in water, the seeds will finish maturing and ripen right before your eyes.



The opuntia cactus showing the fleshy, fig-shaped seed-pods, which are set with clusters of tiny thorns. These seeds provide problems for the collector.

Those of us who grew vegetables from seed during the war discovered indecision among the coles—cabbage relatives. Broccoli came half broccoli and half kohlrabi; cauliflower relapsed into kale; brussels sprouts thought they were partly cabbages, and the gardener began to realize how much segregation is needed in the grower's field, and how many workers it must take to do the roguing in normal years. Because of all this intermarrying that goes on between closely related vegetables it pays to know the ones of which to save the seed; which can be gleaned and used with good results. Do not save seed of any coles, but let one stalk of parsley flower and set seed, then see how much quicker fresh seed comes than stock that has been kept on the shop shelves. Tomato seed is often worth saving, particularly if you have a pet strain that is hard to find in the trade. Tomatoes seem to be homebodies, preferring the same conditions year after year, and plants of squash from seed grown in similar soil and exposure are likely to outstrip those grown many miles away under quite different conditions.

The seed-saver should know something about the longevity of his seed. Pepper, beet, parsnip and pea seeds are among the vegetable seeds

that should not be kept over the second season, and some of the flowers on the short-longevity list are *Phlox, Geranium, Delphinium, Aster* and *Centaurea,* and pansies. *Zinnia, Ranunculus, Cyclamen, Calendula,* and stock and nasturtiums are likely to be good after six or seven years. Some seeds have greater longevity in soil than in air storage, for those of many desert plants germinate after they have been dormant in the sandy soil for twenty years. They wait until the season is just right for them, and then they sprout; or it may take soil disturbance to jolt them into activity. I think those horrible desert sand storms, which pick the sand up from one place and deposit it in another, have something to do with the germination of desert seeds, and I am sure that the shifting of soil on steep hillsides jerks some seeds into operating. This is noticeable along newly made or newly widened mountain roads where the soil from the upper side is bitten off by machinery and dropped loosely to fill the lower side. Soon after the first rains moisten this newly spilled soil it bristles with seedlings, even of such recalcitrant species, so hard to coax up under cultivation, as obstinate, silver-leaved Golden Eardrops. And the same startling thing may happen when the sown flat of some stubborn seeds has been thrown out in high disgust.

In its impatience to be up and doing, lavender seed is exactly the opposite, for it can hardly wait to sprout, and if it is saved long it sulks and will not come up at all. Rarely have I found lavender seed to be good after the second year, but one October when I was garnering the seed of English lavender, I put the bag down to go off on another tack and forgot it. The first rain of the season came that night and a few days later, when I happened across the crisp, discolored paper bag, it was alive with germinated seed, useless, of course, for packeting.

In Nature's scheme of things she has made little allowance for the human seed collector. The plants have not figured out that we are really on their side, that we do not want to swallow their seeds like the chipmunks, nor burn them like the fire, but that we, like the birds, which, without realizing it, scatter seeds of fruits, or fur-coated animals, which unwittingly carry clinging seeds around on their bodies, are deliberate agents of distribution.

Self-preservation and race perpetuation are the two first laws of Nature, and toward this end plants have provided themselves with many tricks and manners. During my twenty-five years as a seed collector I have learned to esteem many of the plant devices; have been amused by some, and have thought a few of them unreasonable and rather silly. It is the need to perpetuate the race that has brought about the mechanism for contracting the valves of the seed pods and violently forcing out the seeds, sometimes sending them flying many feet. The various garden *Impatiens* belong to this group of poppers, the fat ripe pods snapping while the hand that hopes to imprison them hovers above, ready to pounce. The yellow-flowered, creeping redwood violet brings its seeding stem from a reclining position to an erect one in order that the pod may become wind-dried and in a position to explode, and the redwood *Oxalis* goes off before my eyes as though reading my thoughts.

The long, slender pods of the garden glaucium poppy, of the lovely yellow wild tree poppy, and the Californian poppy, split when ripe at the slightest touch, the seed escaping between the fingers of the slow snatcher. We are all familiar with the hot, dry-day performance of witch hazel, lupine, pea and wild lilac, the snapping, shooting and flying that goes on as it does when small boys are celebrating the Fourth of July. The seeds do all this to avoid overcrowding, for they do not like slums.

That is why aviator seeds are equipped for flight. Mountain mahogany is a first-class flier, for the tip end of each seed is attached to a feather that is straight at first and curving as the seed nears the stage of taking off. Thus, it spins downward and lands with the sharp seed-point down, ready to pierce the earth. The seeds usually grow in pairs, but when I grab for them I rarely find more than one when I open my clenched fist in the bag. The cobweb thistle is one of the loveliest things I know, but for several reasons its seeds are difficult to snare. Its silver web is slung between sharp needles, and before the gorgeous purple flower, nested in the center of all this frosted beauty, has dried, a pesky moth has laid her eggs in it and her issue are soon fattening on the unripe seeds. This makes cobweb thistle a rare flower, and the few good seeds that are left are likely to have been floated off by their plumes before I arrive on the scene.

Milkweed seeds wear parachutes to waft them far from the parent plant, and, because of this, milkweed fluff has now become a commercial product. Many anemones and *Clematis* float (Continued on page 392)

A Tithe for Trespassers

By ULRICH TROUBETZKOY

No need to ask the children where they've been:
just look for bruises on the sunburned shin
and for unheeded scratches on the knee.
You may be sure they've stripped each cherry tree
as clean as starlings, or a flock of jays.
Their trespass in the blackberries betrays
each face as painted as an Indian,
and of a tribe that will be back again.
They took a wise appraisal of our pears,
still hard and green, and of that tree which bears
the russet apples, small and bitter now,
and marked the swelling plums along the bough.
You cannot keep an orchard to yourself
except in pies, or jelly on a shelf.
It's not a secret to be locked in words,
so children find it out, and all the birds.

In the center, a leaf-cutting bee, with perfect cells shown on each side of the insect. The sixteen other pieces shown were used in the construction of another cell.

Architects with Leaves

By H. H. PITTMAN

Photographs © by the Author

HONEY-BEES are probably the best known of all our insects, and perhaps the most important of the few that we have been able to domesticate. They are decidedly social insects, living in great communities, which have always been a source of wonder and admiration to observers. And these bees are clever architects with a cell-design that cannot be improved upon. At the height of the honey-flow the inmates of a colony will run into many thousands, so that it is almost surprising to find social habits are the exception rather than the rule among bees, and that there are many solitary ones.

Of all our solitary bees the leaf-cutters, *Megachile*, are the ones most likely to attract attention, for their trade-marks are conspicuous and indicate their presence long before we meet the insects themselves. Wherever ash or rose leaves are found with neat circular or oval disks cut from them, we can be sure these industrious bees are in the vicinity, and, if an observer is lucky, he may be able to watch a leaf-cutter at work. She alights without hesitation on the edge of the upper side of the leaf of her choice and immediately starts to cut out a disk, using her jaws like a miniature pair of scissors. The operation takes only a few seconds, and it is interesting to see how carefully the stiff mid-rib is avoided and how a portion of the edge of the leaf always forms part of the periphery.

Ash leaves from which leaf-cutting bees have cut disks to use in making their cells. A lucky observer may catch the bee at work.

When a leaf-disk is cut, the bee grasps it with her legs and holds it under her body as she flies away. Her flight is rapid, but if we are able to follow her we can learn the beginning of the story and the reason for her industry. Her first task had been to find a vacant tunnel, preferably in a piece of rotten wood, and about the diameter of a large lead pencil. Deserted tunnels left by the wood-boring larvae of other insects are generally chosen, although the bee can excavate for herself if necessary. In southern Saskatchewan tunnels in dead poplar trees are often used and are sometimes discovered when firewood is being cut.

As with honey-bees, once the leaf-cutter has decided upon the home-site, her next task is to construct the cells

This row of old cells used by a leaf-cutting bee was exposed when a dry log was cut for use as firewood. Dead poplar trees are often chosen by the bees for their cells, and although the insects are not social, they are sociable and several may work near one another.

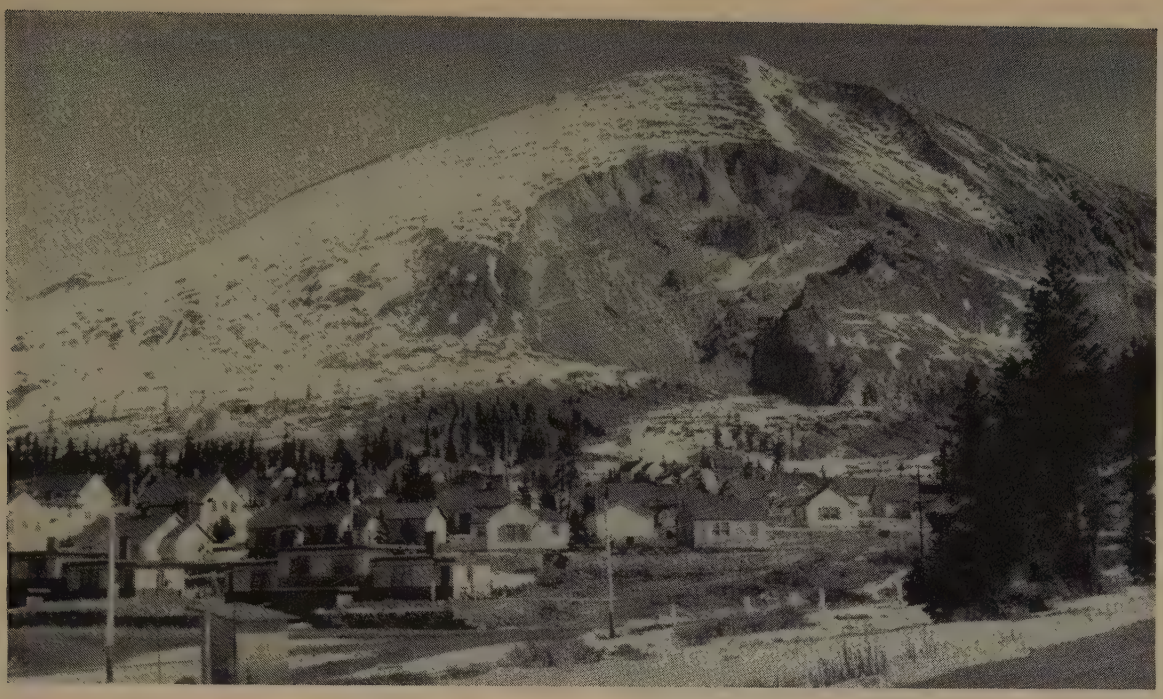
that are to contain her progeny. Her method of doing so is unique among bees, for the cells are built of the pieces of green leaves she has cut from our ash trees and rose bushes. Using the oval or lozenge-shaped pieces first, she carries them into the far end of the tunnel, forcing them against the sides. They are then bent over a little at the far end and over-lapped until a neat, thimble-shaped chamber is formed. Then, abandoning her building, she flies out over the prairie to get honey and pollen to knead into the sweet paste with which the cell will be half filled. When this is done a single egg is laid and the bee goes back to her leaf cutting again.

This time circular pieces are cut and carried into the tunnel to cap the cell. A second cell is immediately built and provisioned in the same way, and this goes on until the tunnel is full and as many as ten or twelve little green cells may be placed, end to end, in a row. Sometimes several cell-filled tunnels can be found in a dead poplar, and all may be the work of the same insect. We cannot be sure about this, for although these bees are not social they are sociable, and several may work near one another.

It seems obvious that all the bees that hatch in a tunnel have to delay their emergence until the larva from the last egg has matured and freed itself, but, while this is true, some curious facts have been discovered in this connection. The last few eggs in each tunnel always produce male bees, which, as with honey-bees, require a shorter time for development than do females. Emerging a day or so earlier, they reduce the number of obstructions ahead of the females, who can then proceed to liberate themselves at their leisure. I found that mature leaf-cutters could remain imprisoned in their cells unharmed longer than honey-bees usually do, and this latitude is important when every bee has to pass through the empty cells of those ahead of it. A leaf-cutting bee can remain in its cell for two, or even three days, and still emerge a strong and healthy insect. The most remarkable thing, of course, is that these bees are able to control at will the sex of the larvae emerging from their eggs.

The eggs generally hatch within a few days and the tiny larvae immediately begin to feed upon the sweet paste surrounding them, which is always the exact amount necessary to last until they are full-grown. They retain their larval form until spring, and then spin a silken cocoon in which they pupate, remaining in this condition within the green cells until the warm weather comes and they can emerge as perfect bees. Such, briefly, is the early life-history of the leaf-cutters under ideal conditions, but it is not always like this, for there are "cuckoo bees," which sometimes manage to place their eggs in the cells during the absence of the rightful owners, and also some tiny, wasp-like insects, which in some way contrive to get their own eggs into the cocoons inside the green cells. In both cases such intrusions are fatal to the leaf-cutting bees.

Our solitary bees are badly named, for it is not unusual for several to be found in neighborly proximity, although each group of cells is the work of a single female. The leaf-cutters' lives are short, for when the last cell is completed and the entrance closed with sawdust and tiny chips, they disappear. The female does not store food for herself and when the natural supply dwindles she must die. The fact that the last eggs laid in each tunnel always produce males brings up the puzzling question of intelligence versus instinct. Superficially considered, it seems to show reasoning. This is not a surprising conclusion because, like the wasps and ants, bees have always been regarded as wise insects, perhaps wiser than humans know.



Bartlett Mountain, high in the Colorado Rockies not far from famous Leadville, is owned by the Climax Molybdenum Company, and is estimated to contain 500,000,000 tons of molybdenum ore reserves.

Miraculous Moly

By EUGENE W. NELSON

MOLYBDENUM is a newcomer among the sixty-five or so metals that science has discovered. It is so new that its very name is strange to most people, yet molybdenum, called "mollie" by the metallurgists and "moly-be-damned" by the miners who have to dig it out of the ground, serves millions of people daily in many ways. Better automobiles, planes, and trains; higher grade gasolines and lubricating oils at prices we can afford; quality radio tubes —these are just a few of the present-day essentials that molybdenum has made possible.

There is some evidence to show that the Greek and Roman metal workers, about 2000 years ago, were acquainted either with molybdenum ore or the pure metal itself. However, they never made any use of it. Some six or seven centuries ago, however, a Japanese sword maker—Masamune by name—produced a number of blades that contained molybdenum as an alloying element. Even though the moly was probably present as a contamination in the iron ore that old Masamune used, and was *not* added intentionally, the sword blades became almost legendary because of their superlative hardness and toughness. Chemical analyses of a Masamune blade about 1900 showed that it was the molybdenum present that gave to the steel its desirable properties.

Since it was known to metallurgists in 1900 that the addition of a little moly improved the properties of steel to such a great extent, one wonders why immediate use was not made of this knowledge. In the first place, molybdenum was at that time—and up until 1918—an extremely rare metal, selling for as much as five dollars a pound. Moreover, there were only a few known deposits of molybdenum ore, and those were of uncertain worth. These factors combined to keep any of the big steel companies, which would have been the logical concerns to develop a molybdenum deposit, from sinking any of their money into such a venture.

It took a curiously inter-connected chain of events to give the world a plentiful supply of molybdenum and the gifts that this metal has to offer a highly mechanized civilization such as ours. Moly's marvelous story, however, rightly started in some primordial time when an enormous deposit of molybdenum ore—"molybdenite," which is a disulphide of molybdenum, —was laid down in Bartlett Mountain. This mountain, which deserves to rank as one of the natural wonders of the world, lies high up in the Colorado Rockies near Fremont Pass, at an elevation of more than 11,000 feet. It is some thirteen miles from the once-famous Leadville. The Bartlett Mountain deposit of molybdenite has given rise to the largest metal mining operation in Colorado, and one of the largest in the whole world.

Bartlett Mountain is almost a solid mass of molyb-

PHOTOGRAPHS FROM WESTINGHOUSE ELECTRIC CORP.

Molybdenum takes a high polish, has the corrosion resistance of platinum and a melting point slightly lower than tungsten, many industrial possibilities.

denum ore. Nothing else like it is known on earth. If you could slice down through the middle of this fabulous mountain, you would see that it consists of a cone-within-a-cone. The outer cone is a ring of ancient schist and granite, ranging in thickness from 250 to 700 feet. In ancient days, this envelope was steamed full of molybdenum by a volcanic blast of mineral-bearing lava that gushed up in a stream from the very bowels of the earth. The molybdenite, however, was *not* deposited in thick veins but in small, hair-fine fractures throughout the entire rocky mountain mass.

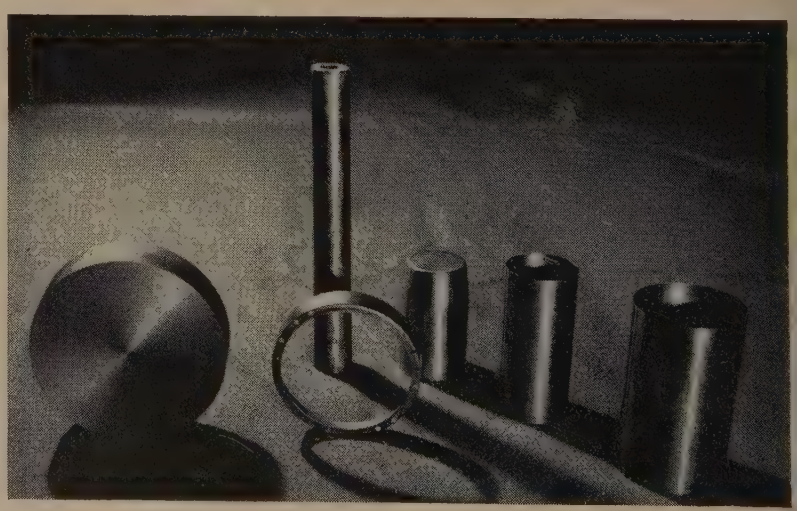
The inner cone of Bartlett Mountain is of a silicious granite and is free from moly in the upper portions. Down in the depths of the mountain, however, this barren central cone becomes molybdenum-bearing ore. Thus, if you could slice off the top of the mountain horizontally, you would find that the hollow, moly-rich ring would measure about 4000 feet east by west and 3000 feet north by south. It would look like an enormous doughnut of valuable ore, with its center filled with worthless rock. Farther down, of course, the "worthless" rock becomes ore again. The proved and probable ore reserves in Bartlett Mountain were recently estimated as being 500,000,000 tons, containing some 1,600,000 tons of recoverable molybdenum.

Although pure molybdenum metal is silvery in appearance, molybdenite is a soft, blue-black substance closely resembling graphite. It is composed of 60 per cent metallic molybdenum and 40 per cent sulphur. A piece of the Bartlett Mountain ore looks like gray rock streaked with heavy black lines. The mineral easily rubs off on your fingers. It was this "rubbing" characteristic, plus the ore's general appearance, that masked so long the immense value of the deposit.

Early prospectors in Colorado mistook the molybdenite deposits in Bartlett Mountain for galena, and later for graphite. In fact, as far back as 1890 claims were staked on the mountain by prospectors who thought that the molybdenite was galena. They dropped their claims when the Colorado School of Mines reported that the ore was only a poor grade of graphite. After this, the older prospectors thought it a great joke to send tenderfeet up Bartlett Mountain looking for gold, knowing that the "Johnny-come-latelies" would find nothing more important than chunks of a puzzling, blue-gray mineral that looked like graphite but which was not even good for greasing wagon wheels.

The truth came out in 1900, when the ore was eventually identified as molybdenite. After passing through several hands, the title of Bartlett Mountain passed into the keeping of its present owners, the Climax Molybdenum Company, in 1916. Since then the organization has done a truly enormous amount of pioneering work both in improving mining and refining methods, and also in finding uses for the metal.

At the time Climax came into possession of Bartlett Mountain, World War I was raging. British metallurgists had discovered that the Germans, shut off by a tight sea blockade from getting any tungsten from China, were smuggling in small amounts of molybdenum from a deposit in Norway. With this molybdenum, the German metallurgists were producing alloy steels which made the German guns stand up under heavy firing far longer than did the best guns of the Allies. So, a call went out for molybdenum,



Ingots of practically any shape can be made from pure molybdenum metal by the new process that has been developed.

and soon Bartlett Mountain was sending forth a flood of this alloying element to strengthen and toughen the war machine of the Allies.

Although the Bartlett Mountain mine was closed down soon after the Armistice, it was opened again in 1924. Since that time, principally through scientific research, which has produced a steady stream of new and valuable ways for using moly, the mine has never again closed.

Miners at the Bartlett Mountain workings will describe molybdenum mining to you in highly technical terms. To the average person, however, these miners are simply caving in a mountain, little by little. Back in the mountain depths, beyond the tunnels, the miners drill their holes, and in these holes place thousands of pounds of explosives. Then everyone runs for safety, the mountain heaves and writhes in agony, and hundreds of thousands of tons of broken ore come tumbling down. Miners claim that with one single blast they once crumbled up 1,250,000 tons of ore!

Endless trains of mine cars carry the blasted ore to the crushers, half a mile away. There the rock is ground to flour-like fineness, in readiness for the mill. In the mill are long batteries of "flotation cells." The crushed ore is placed in these cells, where it is mixed with pine oil, air, and water. The molybdenite particles cling to the air bubbles and float. Electrically driven paddles skim off this valuable "concentrate" while the worthless residue sinks back to the bottom of the cells. The molybdenite concentrate is cleaned, dried, and packed. Much of the concentrate is sent to the converting plant, where it is roasted and then sacked in units of five pounds and upwards, so that the steelmaster can simply toss these containers one by one into the molten bath of steel until he has added just the desired amount of molybdenum.

Much of the approximately 30,000,000 pounds of molybdenum produced each year is used for producing tougher, stronger steels, from which better cars, trains, planes, and many other things are made. One of the magic properties of moly is that a comparatively small amount of it is required to produce a high quality steel—just five pounds of it to a ton of molten steel. A larger amount of moly added to an otherwise properly prepared type of steel gives a product that is super-hard and tough, a steel that has that peculiar property known to metallurgists as "red hardness." Cutting tools made from this type of molybdenum steel will retain their hardness and temper even when heated to a cherry red, whereas tools made from plain steel soften and lose their temper when heated to only a few hundred degrees. This means, of course, faster machining speeds and a saving in money for the machine shops.

There are other magics connected with molybdenum. One moly compound is coming into widespread use in the manufacture of colors and inks. "Molybdenum orange," for instance, is replacing "chrome orange" because the moly product has more than twice the "hiding" ability of the chrome compound. Moly is also used as a powerful catalytic agent in certain oil refining processes that give us high-powered gasoline at low cost. And still other moly compounds are being used in the ceramic industry to improve both glass and enamel.

The very latest molybdenum miracle to come from the laboratories of the research metallurgists now makes it possible to produce ingots of the pure metal weighing 250 pounds, and these are fully 25 times heavier than the biggest ingots of pure molybdenum produced even during the recent war. These large ingots of solid moly have been rolled out into sheets as large as a desk top, and even larger. It is also possible to make practically any shape from the pure molybdenum metal. Previously, it was possible to produce the pure metal only in rods an inch in diameter, and in a few other simple shapes.

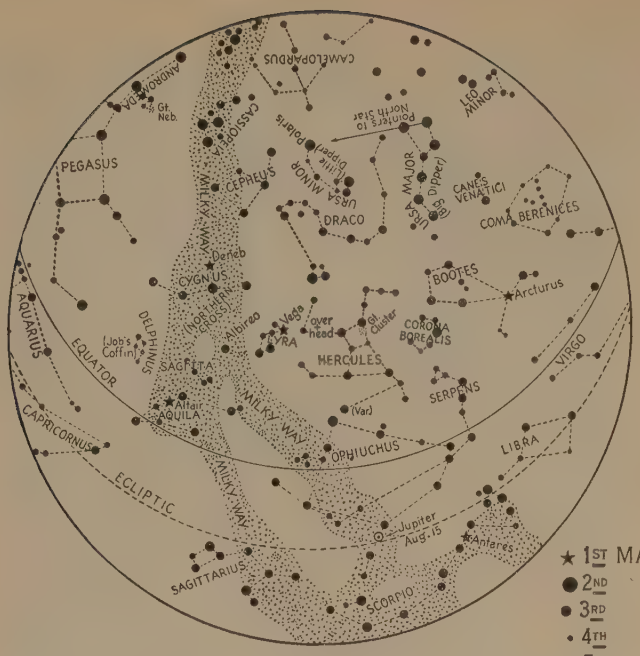
The reason for the excitement in engineering and other scientific circles over the promise of these "king-size" pieces of pure moly metal lies in the fact that this metal has one of the highest melting points of all the metals, and its strength at the highest operating temperatures encountered in industry exceeds that of any commercial metal or alloy except tungsten. Tungsten costs more than moly, is twice as heavy, and cannot be produced in the sizes and shapes now possible with molybdenum. It is predicted that pure molybdenum metal may find valuable applications for blades, tail-pipes, and firing chambers in ultra-high-temperature rockets and gas turbines. The hope of greater propulsive pushes from these two motive power engines hinges upon the development of hotter firing chambers, and on finding a metal for the turbine blades and the rocket nozzles that is tough enough to withstand rough use at high temperatures.

It is more than possible that pure molybdenum may prove to be the final answer. If it is, then we can thank our lucky stars that Bartlett Mountain is in Colorado, not somewhere else where its treasure would harm us.

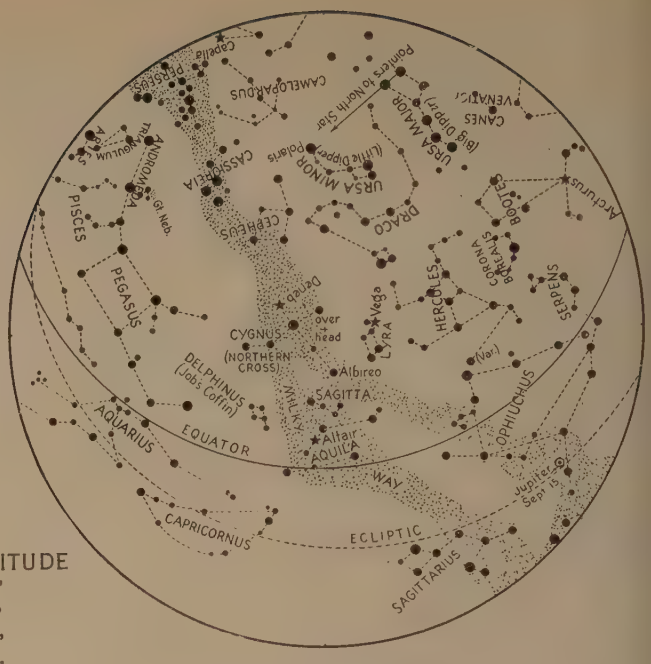
The Planter of Trees

By JOHN E. NIXON

I watched him labor in the pride of May,
Setting with anxious care each tiny thread
Of fibrous root, and then, with gentle tread,
Pressing about each stem the fertile clay;
A gaunt and spare old man with hair gone gray,
His manhood's supple vigor long since fled;
Beside the fragile plants whose needs he fed
So tenderly he seemed more frail than they.
But when his work was done and light grew less,
Held by some dream of beauty yet to be,
He lingered on, with eyes that strove to bless
The task whose glory they would never see,
Yet caught some sight of unborn loveliness
Wherein he saw his immortality.



9 P.M., Aug. 1; 8 P.M., Aug. 15.



9 P.M., Sept. 1; 8 P.M., Sept. 15; 7 P.M., Sept. 30.

To use these maps hold them before you in a vertical position and turn until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

August-September Skies

By ISABEL M. LEWIS

One branch of astronomy that should be of special interest to the amateur is the scientific observation and study of meteors. In this field his aid and cooperation are most welcome to the professional observer who may be engaged in carrying on a regular program of photographic—as well as visual—observations of meteors as part of a research program of wide application and importance.

Observations of meteors may be of the sporadic or systematic type. If one wishes to carry on a systematic program of observation of meteors he may work alone, or with another observer, or a group. The sky is to be observed continuously for a certain interval of time—say for several hours on a single night—or for an interval of time on a number of different nights. The number, color, brightness, and any noteworthy characteristics of all meteors seen will be recorded. The observed positions may be plotted on a star map. The times and place of the observation should also be recorded.

The chance observation of a brilliant meteor, or fire-ball, is an example of the sporadic type of observation. The appearance of a meteor of brilliancy as great as Venus or Jupiter should be recorded with as great detail as possible, and the observation forwarded to an observatory where such records are kept. Information as to the time and place of observation, position of object when first and last seen and approximate length of time visible are of special importance.

The Flower Observatory at Upper Darby, Pa., under the directorship of Dr. Charles P. Olivier, who is also President of the American Meteor Society, is one place where such observations are welcomed. Any person who is interested in the observation of meteors has been cordially invited by the director to write to him on the subject of joining the American Meteor Society and participating in its observations.

August is a most favorable month to become interested in the observation of meteors, for, during the first three weeks in August, many meteors may be seen. These belong to the annual swarm known as The Perseids, so called because their radiant lies in the constellation of Perseus. These meteors, unlike the Leonids and some other swarms that furnish much more brilliant displays in some years, with few visible in intervening years, appear in nearly equal numbers each year. Unless there is bright moonlight the Perseids may be counted on to give a good display, but a clear, dark night is needed to see them to the best advantage. August 12 is the night of greatest display, although they may be seen in large numbers on the two following nights. They are yellowish in color and move with medium velocity. It has been shown that The Perseids, as well as a number of other swarms of meteors, move in the orbits of comets with which they are associated. The Perseids move in an

orbit identical with that of Comet 1862 III. The particles of meteoric dust of which The Perseids are composed, and which represent debris of the comet scattered along its orbit, have individually a mass of only a few milligrams separated by distances of more than 100 miles. From a knowledge of the size of the orbit it is estimated that 500 million tons must be a lower limit of the mass of the comet. It has been found that only short-period comets that make many returns to the sun produce showers of meteors. Fireballs rarely appear in connection with these showers of meteors, and no meteorite has ever fallen to the ground during a meteor shower that occurs periodically each year. Meteorites may be either irons; that is, consist of an alloy of nickel-iron, or they may be of stony, or stony-iron composition. Meteors such as appear in periodic showers are all stony particles.

All meteor showers, it has been found, are not connected with comets, and, vice versa, all comets do not produce showers of meteors. Professor Cuno Hoffmeister, a German authority on meteors, has recently submitted papers of great interest on the subject of meteors to the president of The American Meteor Society. These have to do with the existence of meteoric currents, which form a system of Planetary Meteors with distribution intermediate between that of the Zodiacal Light, which is due to reflection of light from finely divided meteoric dust revolving around the sun to some distance beyond the earth's orbit, and minor planets which lie between the orbits of Mars and Jupiter. Some of these currents, called Ecliptic Meteoric Currents, lie closely confined to the plane of the earth's orbit, while others are more highly inclined to it, as are orbits of some of the asteroids and comets. All of these Planetary Meteors have orbits that are ellipses of short period and similar in size and shape. They come so close to the earth that many meteoric particles in these currents enter the earth's atmosphere and are consumed without reaching the surface.

A new branch of meteor research began with the application of photography to the study of the velocity of meteors. This work was pioneered by the Harvard Observatory, and it has great importance in connection with the study of the earth's upper atmosphere and other varied researches. It has received an added impetus through the synchronized observing program being carried on at Cambridge and its Oak Ridge station nearby. When a meteor is plotted simultaneously at two stations, which may not be more than twenty miles or so apart, the points of appearance and disappearance of the meteor and its velocity may be very accurately found. Meteors in general become visible from 40 to 80 miles above the earth's surface, and their velocities range from 20 to 60 miles a second. According to the latest report of the Harvard Observatory the work on the photography of meteors, which had been carried on at the important solar station at Climax, Colorado, has now been transferred to southern New Mexico. The chief cause for the change is the uncomfortably high altitude at Climax, although the climatic conditions also seem to be better a few hundred miles farther south in a semi-desert region. Although there has been some delay in procuring the glass necessary for the Super-Schmidt cameras to be used in the meteor work, four meteor cameras, two to be installed at each of two stations twenty miles apart, are now being constructed. At the same time, much experimental work is being done both in the photography of meteors and a study of meteor trails. An interesting feature of the work is the transformation into meteor "observatories on wheels" of several trucks and trailers from Army surplus equipment. Temporary cameras may be used in systematic meteor observations in New Mexico by the Harvard astronomers this summer, while awaiting the completion and installation of the four meteor cameras at the two selected sites. The program that is to be undertaken will be one of pure research in meteors and allied problems.

The Harvard Observatory is also seriously considering the possibilities of establishing another well-equipped solar observatory near Alamogordo, New Mexico, it is also stated in this report. This is to a large extent a result of the success of the station at Climax and the skill of the observers carrying on the work at that station. It is expected that it will be decided this year whether extensively to enlarge the solar work of the Harvard Observatory in the Southwest. The new equipment and new programs of research in solar and stellar astronomy may be carried on simultaneously at the two stations at Climax, Colorado, and Alamogordo, New Mexico. It is expected that both the Harvard Observatory and science will profit greatly from these new programs now being planned in the departments of solar and meteor research.

During these two months (Continued on page 392)

Meteor Shower

By JOHN GALLINARI WHIDDING

All night the stars fell like a shining rain
Against the window of eternity;
We stood and watched them spatter on the pane
In lovely ecstasy.

All night the radiant storm dropped out of space
Unmeasured by the yardsticks men devise—
A matchless pouring forth of silver grace
Upon our lifted eyes.

Till dawn, the gleaming meteors in spate
Rushed headlong out of heaven in our sight:
How merciful of God, Whose heart is great,
To prove His care all night.

Camera Trails

By EDNA HOFFMAN EVANS

THIS is a continuation of the how-to-take-flower-pictures discussion begun in the preceding section. For that reason, there seems to be no point in thinking up a catchy opening paragraph. Instead, we will just continue from where we left off, and pretend there were no weeks intervening between one writing and another.

Actually, there has not been much change. The new pup, somewhat larger now, is still frisking about. The sun is shining and the breeze whispers among the willow branches. The green beauties outdoors, interspersed with flashes of color or clusters of fragrant white blossoms, still tempt the flower photographer just as much as before. Other things change, individuals come and go, but Nature will be the same next year, and the next—a blessing for which people who love growing things and enjoy the beauties thereof should be exceedingly thankful.

This section of "Camera Trails" will consider some of the gadgets a clever photographer can concoct in order to insure better results with his flower pictures. It is not a case of gilding the lily—it is just the good old American trait of knowing what you want and then devising ways of doing the job better, and perhaps in a speedier, more efficient manner.

Tom L. Frentress, who lives on the edge of his own orange grove near Highland City, Florida, has been a camera fan since the days when he used glass plates in a big, old, box-type camera. Of late, he has gone in for movies, for color, and for flower closeups. He also photographs snakes, lizards, insects, birds, Seminole Indians, and whatever else he can find in the way of variety and color. No visit to his home is complete without a "picture show."

Tom Frentress likes to learn from experience; to profit by his mistakes. For that reason, he doesn't "edit out" the bad spots from his reels of film. Instead, he frankly states, in the running commentary accompanying each, that this part is good, this is fair, and this is definitely bad. More than that, he figures out what makes each part good, bad or indifferent, and knows what to do next time in order to duplicate successes or to avoid a repetition of errors.

For a long time backgrounds bothered him. He tried a variety of flat surfaces, and finally hit upon a cone arrangement. He now has a system whereby the plant can be placed

A unipod for the camera and a tripod for the cameraman help in the case of special pictures, and the arrangement can be used with or without a blind. Both unipod and tripod are made of aluminum.

By using this aluminum cone instead of a flat background, amateur cameraman Tom Frentress gets highly satisfactory color movies of flowers.

in the open mouth of the cone, with no leaf shadows or splotchy areas behind it. Instead, the sloping, receding walls of the cone, painted a fairly dark blue, give a smooth, deep, even background, with nothing to detract from the center of interest.

Blue seemed to be the best color, for it clashed less with green leaves, and with the tones of any flowers placed against it. The cone, itself, has gone through several transformations. The original one was made from a strip of linoleum. The latest is aluminum, with a mouth not exactly circular, but some 46 inches high and approximately 36 inches across. From mouth to pointed tip, it measures approximately five feet.

Mounted on a wooden frame, at the proper height for camera and tripod, the cone has served as background for many types of plants—from orchids, both native and exotic, to lilies, bright-leafed caladiums, and many others. When not in use, the aluminum light cone can be lifted from its frame and stored in the garage out of the weather.

Frentress does not use artificial lighting. Florida sunshine is abundant and he feels that flowers look much more natural under real sunlight than they do under any sort of man-made light indoors. Some, of course, show up better in the shade, others under full sun. It depends on the color, the time of the day, and on a variety of factors that change with circumstances, seasons, and even with the cameraman's state of mind.

The cone arrangement is a good one for large subjects and for flower-and-plant-combined pictures. Single flower closeups require other arrangements.

A glance at the illustration will tell more than could several paragraphs of explanation. The camera is mounted on a board and the flower fastened to a clip-tipped arm that can be set at varying distances. The arm is jointed and hinged so it can be turned and twisted to whatever angle is desired.

Backgrounds are of little importance here. The focus is so close that nothing but the flower, itself, matters. By careful consideration of light and measurement (Frentress often works with an exposure meter in one hand and a magnifying glass in the other) every detail can be made sharp. Shutter speed and lens aperture are of vital importance, of course, and when they are properly calculated every detail—from petal tip to throat, anther, stamen, pistil and the rest—all appear sharp, with no blurs or fuzziness anywhere.

Of course, since Frentress is chiefly interested in motion pictures, movement on the part of his subject is not objectionable. Instead, it is rather to be desired. Thus, he does not worry when a breeze causes the petals to flutter, or even sways the whole flower. Naturally, there should not be a full gale blowing, but a breeze does not bother a flower movie photographer.

(Continued on page 382)

Importance of Botany

"Botany and Our Social Economy" is the title of a booklet by Alexander C. Martin, research biologist of the United States Fish and Wildlife Service, recently published by the National Wildlife Federation. This 32-page, illustrated booklet discusses the importance of plants in today's world, their marked depletion, natural and human barriers to their restoration, and the responsibilities of educators in assuring a decent supply of natural resources for tomorrow's generation. The publication is directed for the attention of teachers of biology, geography, general science; and of elementary science and social science. Copies are available at ten cents from the Servicing Division, National Wildlife Federation, 20 Spruce Street, Boston 8, Massachusetts.

Game Bird Guide

Guide to Game Birds. By Edmund J. Sawyer. Bellingham, Washington. 1948. Published by the author at 2700 Maplewood Avenue. Illustrated in color and black and white by the author. Fifty cents.

This is a handy little pocket booklet; a condensed field guide to naming the game birds of the United States and Canada. There are two colored plates, one of game ducks and the other of grouse, quail and pheasant. There are other black and white plates, and several pages of outline drawings showing the appearance of typical water birds in flight, and providing other simple means of determining the species observed. This is a booklet well worth the half dollar asked, and is equally of interest to gunner and bird student.

Garden Soils

Garden Soils: Their Use of Conservation. By Arthur B. Beaumont. New York. 1948, Orange Judd Publishing Co. 280 pages. Illustrated. $3.50.

This book is designed primarily for the home gardener and is intended to bridge the gap between books on soil science and those on the culture of vegetables. Inherent in the text is much matter on conservation of soil, water and organic matter for soil improvement. This volume, therefore, fits admirably into the awakening appreciation of the fundamental importance of the soil and the necessity of caring for it properly as a part of our conservation program.

Eruptive Rocks

Eruptive Rocks. By S. James Shand. New York. 1948. John Wiley and Sons. Third edition. 488 pages. Illustrated. $7.50.

This is a textbook on the genesis, composition and classification of eruptive rocks and their relation to ore deposits. It is a volume designed for the advanced student.

Alaskan Birds

Birds of Arctic Alaska. By Alfred M. Bailey. Denver, Colorado. 1948. The Colorado Museum of Natural History. 318 pages. Illustrated. $4.50.

This volume is the result of more than a quarter-century of collecting and study by the author in the far north, and is based directly upon fifteen months of field work from Bering Strait along the Arctic Coast to Demarcation Point. It includes the results of his winter work at the Eskimo village of Wainwright, and the long dog-sled journey from Point Barrow to Cape Prince of Wales. It is, therefore, a combination of a story of Alaskan life and bird study. It deals with an area of outstanding military interest today, and is a distinguished contribution to ornithological literature.

Heads Forestry Association

S. L. (Jack) Frost of Texas has been named executive director of the American Forestry Association, filling the office left vacant by the retirement of Ovid Butler. Mr. Frost takes over his new responsibilities after leaving the post of acting state forester of Texas. He served also as the secretary of the Texas Forestry Association.

Woodland World

Woodland World is the name selected for a tabloid-size, newspaper format educational publication brought out by the Canadian Forestry Association, 679 Belmont Street, Montreal, Canada. Its aim is "to encourage the conservation of our woods, wild life and soils for all time."

Canada to the North

Canada Moves North. By Richard Finnie. New York. 1948. The Macmillan Company. Revised Edition. 239 pages. Illustrated. $3.75.

When the first edition of this book appeared in 1942 its premise that the polar regions of Canada offered great possibilities that already were being realized, was doubted in some quarters. The intervening years have proved the author's contentions and claims to have been eminently true, and his vision for northern Canada has greatly increased credibility. The author knows this north country intimately, the peoples there and the social and economic problems involved.

Bulldog

The Bulldog. By Enno Meyer. New York. 1948. Orange Judd Publishing Co. 151 pages. Illustrated. $3.00.

Written by a man who has spent many years in the breeding and study of pure-bred bulldogs, this is a manual for any owner of this breed. The information contained between its covers is so presented that it is of value to the layman or beginning owner.

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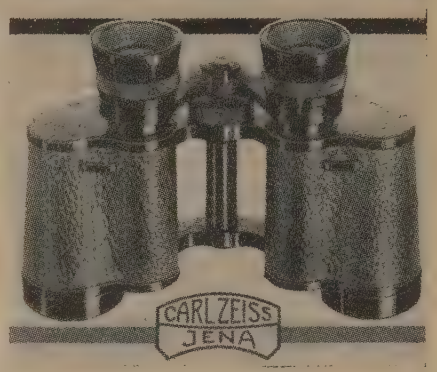

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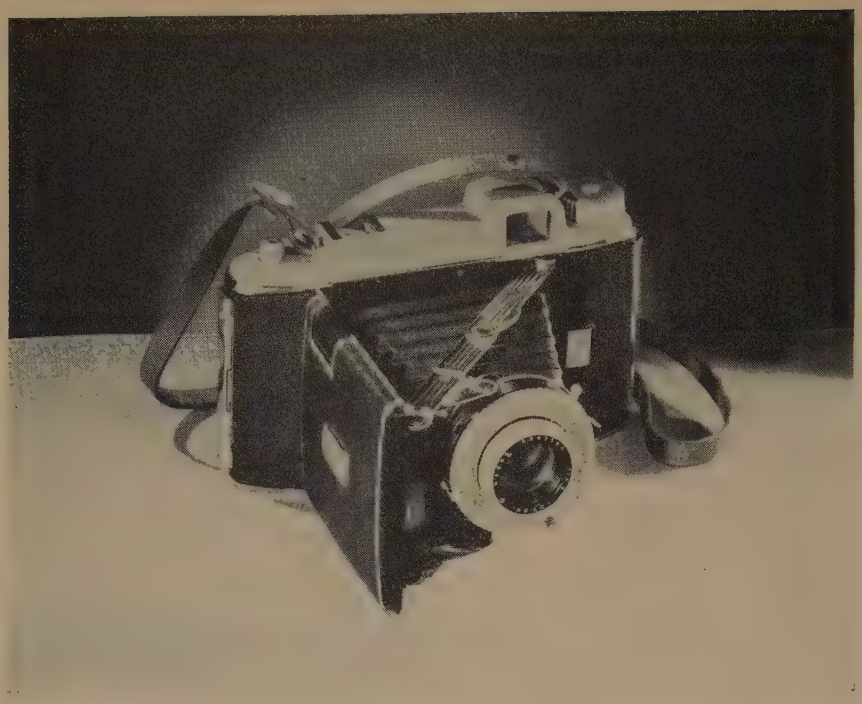

This is Eastman's newest camera—the Kodak Tourist. It takes pictures that are 2¼ by 3¼.

On the other hand, when Frentress is taking "stills," either black and whites or color transparencies, even the faintest breeze is unwanted. The focus is so fine and the measurement so sharp that the slightest movement will spoil the picture.

This flower-photographing arrangement can be used in taking insect closeups, too. Frentress has devised a small, glass-fronted and backed container that can be clipped in place in front of his lens. When an insect—say a scorpion, a bee, moth or dragonfly—is placed between the glass plates, it is held firmly (but not crushed) and can be photographed front, back, diagonally or in sections.

Among the other gadgets Frentress has devised are a unipod for his camera and a tripod for himself. Both are made of aluminum, can be taken to pieces, carried with ease in compact form, and reassembled in a remarkably short time.

The unipod is merely a single, extensible arrangement of aluminum tubing, with an adjustable attachment for the camera at one end. The other end either can be placed on the ground or can be fitted into a slot in the tripod, which serves as a seat for the cameraman, and which raises him varying heights above the ground.

The accompanying illustration shows how readily the arrangement can be adapted for a variety of wildlife pictures. Suppose there was a bird's nest in the hollow of the old live oak tree. The camera and operator are at just the right height for taking such a picture. The arrangement can be used readily inside a blind, and the wild subject need never know that its picture is being taken.

Tom Frentress has concocted other gadgets, too—glass-sided cases for lizard and snake pictures, for example. He still has not figured out how to get complete cooperation from his reptilian subjects. They either wiggle too much or not enough, and tend to stay in corners rather than take the center of the stage where photography is most satisfactory.

But Tom Frentress has the various aspects of flower photography pretty well under control. Perhaps some other "Camera Trails" readers can give him helpful hints on the proper psychology to use on reptilian subjects.

I like to see originality, and to find folks who have the ability and the ingenuity to devise methods of their own for improving their pictures. This is particularly important in a specialized line like Nature photography. Things like Tom Frentress's cone and his devices for closeup flower pictures cannot be bought. They have to be home-made.

On the other hand, there are some photographic supplies that are easier to buy than to build—and the cost is not much different in the long run. That is why, when an occasional reader writes in for instructions as to how to build an enlarger, I usually advise a "boughten" one, instead. That is something for the commercial manufacturer. Few people, nowadays, build their own cameras or mix up their own film or sensitized plates. Those things belong to photographic history. So do home-made enlargers—at least to my way of thinking.

TRADE NOTES

There has been quite an accumulation of trade material since the last writing. Eastman, for example, has brought out several new things. There is a new folding camera, called the Kodak Tourist, which will take 2¼ x 3¼-sized pictures. Listed among the Tourist's special features are a new type shutter release, a built-in exposure guide to cope with all types of outdoor picture-taking conditions, and built-in flash synchronization. The camera is priced at $61.50, plus tax.

The same company also has issued new editions of two data books, "Kodak Papers" for darkroom addicts, and "Kodachrome and Kodacolor Films" for color fans. While the latter has a special section of general outdoor picture suggestions, the whole 60-page book is worth reading.

Also of interest to the darkroom fan, providing he has $27.00 to spend on it, is the enlarging easel built by the FR Corporation, 951 Brook Avenue, New York City. This easel features a "third hand" arrangement designed to hold the paper firmly when the mask is lowered, thereby guaranteeing even margins and eliminating fingerprints. For anyone who has "margin trouble," as I do, such a third hand would be mighty handy.

Finally, and still in the darkroom, is the latest type light equalizer built by Burke and James, Inc., for their Solar Enlargers. The new unit, which consists of two circular sheets of glass, one with a full frosted surface and the other with a graduated frosted surface, is said to give nearly twice the amount of illumination, while cutting exposure time approximately in half. The assembly costs $3.75, either from a dealer or direct from the company, 321 South Wabash Avenue, Chicago.

Nature Photographs

The Eighth Annual Exhibit of Nature Photography, sponsored by the Kentucky Society of Natural History, will be held in Louisville from November 21 to 28. The closing date for entries is October 23. Entry fee is one dollar for each set of prints or slides with a limit of four prints and/or four transparencies. Full information and application blanks may be obtained from the Kentucky Society of Natural History, Box 81, University of Louisville, Louisville 8, Kentucky.

Maryland Salon

Announcement is made of the First Maryland Salon on Natural Science Photography to be exhibited at the Baltimore Museum of Art, beginning January 4, 1949. Submission of prints is invited by the sponsors, The Natural History Society of Maryland, and full information and entry blanks may be obtained from Earl H. Palmer, 2101 Bolton St., Baltimore 17, Maryland. There will be four classes of pictures—plant life, animal life, scenic and scientific.

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Friendly Junco

Alice B. Sprecher of Delong, Indiana, writes to share with others an interesting experience with a junco individualist if ever there was one.

"This bird persisted in trying to get into the house," she writes, "but always at night. He'd fly against the windows repeatedly; fly in and perch on picture frames when the window was opened. He even perched on my husband's foot as he sat reading. He would come to the window of whichever room we were in, and was our guest for several winters.

"But the most amazing thing happened one early spring day. Our large Persian cat was sleeping on a sloping cellar door outside the window. I heard a chattering outside and looked out to see what the bird was scolding about. The junco, scolding all the while, was hopping toward the cat, which, I suspect, was pretending to sleep. This seemed a foolhardy business, so I chased the bird away, for its own safety. A bit later I heard more commotion, and there, still scolding, was the bird perched on the cat's back. The Persian opened one sleepy eye, looked at the junco, waved her tail a few times and went back to sleep. I am not sure which was craziest, cat or bird, and I wonder whether anyone else has had a like experience?"

Plant Story

The Story of Plants. By John Asch. New York. 1948. G. P. Putnam's Sons. 407 pages. Illustrated by Tabea Hofmann. $5.00.

In this book the author seeks to present in a single volume "a summary of the important features of plant life, described in nontechnical language that a person with little or no knowledge of botany and related subjects can understand without consulting a glossary or dictionary." Personally we see no reason why exposure to a dictionary now and then is something to be abjured, but the author has presented a popular and comprehensive text that should find a wide and interested audience.

Trail Dogs

The American Trail Hound. By Fred Streever. New York. 1948. A. S. Barnes. 202 pages. Illustrated. $3.75.

This is a guide to the origins, training and care of the various breeds of hounds, and constitutes the first complete book on what is commonly known today as the American Trail Hound.

For Horse Lovers

The Horseman's Year. Edited by W. E. Lyon. New York. 1948. A. S. Barnes and Company. 176 pages. Illustrated. $5.00.

This is a volume made up of contributions on horses by nineteen authorities, all of them British, and it covers the fields of racing, show and other equines during 1947-1948 in Great Britain.

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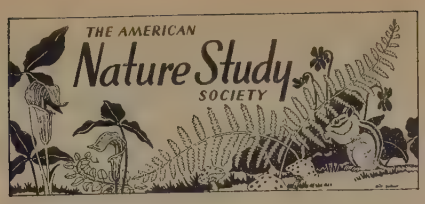

MEDIA OF OUTDOOR EDUCATION FOR URBAN CHILDREN

By ROBERTS MANN

Superintendent of Conservation, Forest Preserve District of Cook County, Illinois

FOR two years, our naturalists of the Forest Preserve District of Cook County, Illinois, conducted experimental field trips into the outdoors for selected groups of children from Chicago and from suburban towns—groups of varying ages, nationalities and economic status. We also took groups of school teachers on similar field trips. We confirmed our thesis that urban children are avidly hungry for Nature lore and outdoor experiences, firsthand; that they are not getting them, and that Chicago children, particularly, are utter strangers outdoors; that too many teachers are also strangers outdoors and lack either the knowledge, or the training, or the ability—or some combination of the three—to teach the natural sciences; that there is a wide gap between the classroom and things as they exist, a gap that should and can be bridged. We set about to bridge it.

Since January, 1945, we have issued a weekly Nature bulletin. The distribution now exceeds 10,500 copies and will reach 20,000 when we succeed in getting one copy to each teacher in every school in Cook County, both public and parochial. They are also being reproduced and distributed in several other counties of Illinois, and some suburban towns—notably Joliet, Milwaukee, Detroit and Minneapolis.

Each summer we supply naturalists to day camps, conducted by youth organizations, settlement houses and recreation centers in our preserves, taking the children in groups of 25 or 30 on 50-minute Nature walks. We try to give each child at least four such experiences. This summer we will serve such camps at the rate of nine each day, and handle several thousand kids.

During the past school year (1947-48), as "Uncle Ezra," a web-footed character from the Illinois River bottomlands, I broadcasted a "Nature Walks" program every Monday over Station WBEZ (FM) of the Chicago Board of Education Radio Council. It was also piped out over Station WIND. Designed to supplement, with an accompanying handbook, the new courses in science for the 3rd and 4th grades of the Chicago public schools, it developed that these broadcasts were enjoyed also by the higher grades in many schools, both Chicago and suburban, both public and parochial, and by some high school biology classes. It must be admitted that some of the scripts were not entirely suitable for the third-grade level. This series will be revised and repeated next year, and a new series initiated for the 5th and 6th grades.

As the result of an experimental television broadcast, wherein we put through their paces a screech owl, a short-eared owl, a little brown bat, a defrosted skunk, a fox snake and a photogenic bull snake, we will do a series of telecasts during the coming year—some by remote control outdoors. There are now 16,000 television sets in the Chicago area (including about 3000 in taverns) and many schools are purchasing video sets. If pink elephants are needed, we will furnish them.

A fifth truss-member of this bridge we are building has been the sending of a naturalist into the schools to deliver illustrated lectures to assemblies. It was hard to get our foot in the door. We finally sold the idea to the superintendent of a suburban district, and then staged a free fish-fry and outing for the association of superintendents, of which he was a member. The word quickly got around that here was something new, unique and valuable, but free for the asking. Soon, our naturalist was delivering from one to four such lectures every school day in suburban and rural schools throughout Cook County. That first year they were illustrated with 3¼ x 4-inch slides, mostly colored. School periods being usually of 45-minute duration, that meant 45 minutes of talking, and when you do that two, three or four times per day you can lose your spontaneity, and your voice.

So we bought some of the finest available one-reel (400 ft.) 16 mm. color movies, with sound. We bought projectors, amplifiers and portable screens suitable for use in large auditoriums, if necessary. This year, standard procedure has been as follows: First, the naturalist talks for about eight minutes on good outdoor manners and what can be seen and enjoyed in the forest preserves. Then he runs two reels, which require a total of 27 minutes. Then, after the first, second and third grades go back to their classrooms, he gets back on the platform and offers to answer questions. Then the fun starts.

According to schedule, there are only ten minutes left for questions. But in none of the 131 schools visited during the past year did he spend less than 25 minutes—running past the end of the 45-minute period to one hour or more—and in one extreme case, where he began at 9:00 a.m., the discussion had to be ended because it was lunch time.

The question-and-answer technique is invaluable as a short cut to the children's curiosities. It is not the honor students in other subjects who display the greatest eagerness and ask the most pertinent questions, according to teachers. And in about 90 percent of the schools the teachers also asked questions—questions of about the same level as those of the pupils—and stated that scarcely a day passes without some child presenting some animal or plant for identification, or asking some difficult question.

In rural schools the questions are few but technical. This is relatively true in suburban schools, where our preserves and the names of common mammals, birds, reptiles, amphibians and insects are familiar to most kids. In the few Chicago schools we have visited, the situation is entirely different. From 20 to 30 percent of Chicago children, in the heart of the city, have never been in our forest preserves or outside the city limits. They bombard you with questions, usually elementary or naive.

Experimenting with lectures in settlement houses, outside of school hours, to children from the surrounding "blighted" neighborhoods, we found that as much as 80 percent of such children have never visited our preserves, and that their ignorance of the most common animals and plants is appalling. In one case, when our naturalist was introduced he heard one lad say to another: "What's a forest preserve?" And the other replied: "Don't you know, that's a place where two trees grow at once!"

It seems to me that too many commercial movies are being shown by representatives from utility and manufacturing corporations as a part of visual aid programs. The kids are growing sour on telephones and plastics. An entire field of vital interest and of vital importance in education is being neglected. We are besieged with requests for repeat programs.

New year we will devote all our time to the Chicago schools, public and parochial, and to settlement houses. If we can find another young college man, resident in Chicago but with a farm background and a broad, thorough biological training, who likes people and especially kids, and who has the God-given knack of talking to kids—we'll hire him. Maybe two. Maybe the clamor in the suburban schools will needle their administrators into meeting that demand themselves.

For the next ten years we'll be answering such questions as: "Do bats get in your hair?" "Does the porcupine shoot his quills?" "How old is the oldest living thing and what is it?" "How old does a parrot (for example) get?" "Why doesn't the father (of most animals) stay with the mother while she is raising her young?" "What poisonous snakes are there around here?"

And we'll be parrying the jackpot questions: "Is it true that men come from monkeys?" "Where do baby animals come from, and how?" *Ad infinitum.* I tell you "we ain't been doing right by our little Jack and Jill!"

Seek Curlew Nest

The bristle-thighed curlew is the only North American bird whose nesting place and fledgling young have never been found or described. Deriving its name from the lengthened shafts of some of its flank feathers, which project from its sides like stiff hairs, this bird was described from Tahiti in 1785. The first specimen was taken on the Alaskan coast in 1869, and all subsequent specimens have been taken near the shoreline. This year an expedition headed by Dr. Arthur A. Allen, and sponsored by the National Geographic Society, Cornell University and the Arctic Institute of North America, went into the interior mountain lakes and other areas of Alaska to try to find the nest and record in data and film the missing details of the birds' life history. P.S. The nest was found. A message from the North reports the success of the expedition.

Hungry Leopard

The Man-Eating Leopard of Rudraprayag. By Jim Corbett. New York. 1948. Oxford University Press. Illustrated. $2.50.

Here is another account of one of the most publicized animals that has ever lived, told by the man who hunted the man-eater for nearly two years and finally killed him. Preying upon the inhabitants of Garhwal province in India for eight years, the leopard killed more than 125 people in an area of five hundred square miles. His killings received attention in the press of the United States and the British Empire, but few volunteered to rid Garhwal of his presence. In 1925 Corbett and Ibbotson, Deputy Commissioner of Garhwal, began to track the leopard. Bad luck stalked the expedition. Several times they were almost successful, but it was not until almost two years later that the man-eater of Rudraprayag was killed on a pilgrim road where he had taken several lives. The endurance of both the hunter and the hunted is a feature of this book. The leopard seemed to thrive on poison, and the longer he was stalked the more clever he became. Corbett was most deserving of the gratitude heaped upon him for ridding Garhwal of the eight-year rule of an unusual and vicious predator. S.V.H.

Farmers of the Past

Farmers of Forty Centuries. By F. H. King. Emmaus, Pa. 1948. Rodale Press. 379 pages. Illustrated. $5.00.

Penetrating into the back country of China and Japan, Dr. King studied and recorded the methods by which the old races of these lands preserved the fertility of the soil, working with Nature to preserve, also, their own existence. Thus the author gives his book a subtitle of "Permanent Agriculture in China, Korea and Japan." The book was originally published in Great Britain. The central principle of Oriental farming was, of course, scientific husbandry of soil through compost and the restoration to the soil of that which man had taken from it. There are lessons in this book that we who rape the soil and then turn to chemicals to restore its virtue may well heed. The fact that these Oriental lands have sustained teeming populations for centuries should pique our interest, and this book provides a surprising satisfaction of that interest.

Pete, the Crow

From Aylesford, Nova Scotia, W. A. Brown reports on the talents of a crow named Pete, ward of one of his nieces. Pete was found, when a young crow, with a broken wing, which was set in splints and healed nicely. Pete could fly, although slowly, and preferred to remain as a pet, roosting with the White Wyandot hens. Soon he picked up their calls and cackles, and when a rooster was added to the flock, quickly could crow so well that the hens were never certain who was calling. Pete used to enjoy going to school to show off his "vocabulary." In winter he loved to go coasting, but having no sled of his own, would lie down on his side and slide down the slick, crusted ice. At the bottom of the hill he would get up, shake out his feathers, then climb the hill to coast down again.

Guide to Insects

The Insect Guide. By Ralph B. Swain. New York. 1948. Doubleday and Co. 261 pages. Illustrated in color and black and white by Suzan N. Swain. $3.00.

This is an excellent guide to the identification of the members of the orders and major families of North American insects. The text is written in non-technical terms, and the illustrations total 450, of which 330 are in full color. With some 670,000 different kinds of insects described since the days of Linnaeus, and probably two million different species and sub-species in existence, no one volume could hope to do more than start one on insect study. One should, however, be able to learn to recognize the larger groups of insects, and, if necessary, pursue study further in more specialized texts. This guide provides a splendid introduction.

Raising Minnows

"Propagation of Minnows and Other Bait Species" is the title of Circular #12 of the U. S. Fish and Wildlife Service. The title of this 113-page pamphlet is descriptive of its contents. Its authors are J. R. Dobie, O. L. Meehean and G. N. Washburn. Copies are available for thirty-five cents from the Superintendent of Documents, Washington 25, D. C.

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TAIL TALES

(Continued from page 352)

had twisted its tail around until it was actually tied in a knot, which would have prevented the attacker from completing its meal. When the two men disturbed the water snake, it let go its victim. Immediately the garter snake untied the knot in its tail and wriggled away apparently little the worse for its experience. This seemed such a tall tale that the ornithologist told me he had never published anything about it for fear of being called a Nature faker. But he had asked his friend to write him his recollection of the event some time later, and it tallied in every respect with his own.

I told this tall tail tale, one day, to my friend, Dr. Charles M. Bogert, head of the herpetology department at the American Museum of Natural History. To my surprise he said he did not doubt it at all. Then he told me another even more remarkable instance of a reptile using its tail to save its life. With it, I will end this record of the odd and manifold ways in which various creatures put their tails to special uses.

In the West, there is a lizard that sometimes employs an astonishing ruse to avoid being swallowed by a snake. The lizard loops its body around the limb of a tree and grasps its tail in its mouth. In this position, it presents the appearance of a doughnut. There is no loose end at which the snake can begin the process of swallowing. After futile attempts to find a starting point, the outwitted serpent may crawl away down the tree. Its intended victim lets go of its life-saving tail and scrambles away, alive and relatively unharmed.

MOUNTAIN BEAVER OF THE WEST

(Continued from page 357)

been hurt, for the powerful incisors and strong jaw muscles are capable of giving deep wounds. While in the trap great care in handling the animal had to be exercised.

Before he had been confined twenty-four hours the captive was taken out to be photographed. A wire fastened to a hind leg prevented escape and he was put down in a spot resembling his habitat. After several determined efforts to escape, he suddenly stopped his struggles and seized a tender young shoot of the "elk-brake" by which he was surrounded, and proceeded to feed as quietly and as unconcerned as if he were perfectly free. He was quite touchy, however, and any sudden movement resulted in an attempt at freedom. He sat up a great part of the time, and, if annoyed while in this attitude, sparred like a bear with his fore paws, showing a perfect control of his position.

So rapidly did he become tame that by nightfall of the first day he took young fern shoots from the hand and ate them while seated upon the window sill. He also ate a number of fern tips, generally selecting the youngest and softest from the handful offered him. The elk-brake, *Pteris aquilina*, which seems to be one of the main articles of diet, has many branching stems. The showt'l clipped off an inch or two of the terminal stems, a single snip of the sharp incisors generally severing the small stem. Then, holding the stem in his fore paws, he passed the tender fronds back between his molars, and, with a rather hurried crunching, swallowed them. Some preference was given to the more succulent parts, the stout stems being discarded. The procedure of the animal was squirrel-like, with the back somewhat arched.

The captive drank large amounts of water when it was given to him. He put his nose into the water and drank, rather than lapping. As an experiment, the animal was liberated in a small, clear brook and was put into a fairly deep pool. He swam ashore, showing no fear whatever of the water, but evidently had no particular fondness for it. He swam well and rapidly, and his unfrenzied procedure showed he had no dread. He looked very much like a slowly swimming, tailless muskrat. He spent some time after coming ashore in shaking out his fur and going over his sides and belly before he felt sufficiently comfortable to begin eating. He washed his face after the manner of small mammals, reaching back with his fore paws to his shoulders and hinder neck readily. Irritated, he twitched his whiskers energetically and, when most angry, uttered a husky, querulous note something like a cough. He often satisfied his curiosity by snuffing and working his nose, and this member seemed to be very sensitive, for the slightest blow upon it produced spasmodic starts. When aroused, his eyes had a bright, alert appearance, but quickly took on a dull listlessness when he relaxed at ease.

The mountain beaver's body was very hard and firm to the touch. When he was running free, I put my hand under him, and he seemed to brace himself, and at times become rigid. By the end of a week he had become so tame that he never offered to bite, seeming to accept the conditions as inevitable, and, while not showing any appreciation of caress, such as some tame animals display, his attitude was one of complete indifference. He soon cut off the toes from the foot that had been pinched in the trap, but evinced no concern over the fact, and made no attempt to gnaw out of the box.

A pronounced musky odor is given off by this animal when alive and is also noticeable in skins some months old. This odor is pronounced in freshly killed animals, and has a strong, penetrating quality, rather pleasant than otherwise. It recalls, most nearly, the scent of the muskrat, *Ondatra*. No very young animals were captured.

A variety of plants were noted as forming the food, those predominating being the thimble-berry, *Rubus parviflorus*, the large elk-brake, *Pteris aquilina*, and two species of sword-fern, *Aspidium*. The elk-brake and the two ferns were the most preferred, and often to be seen in the burrows and runways, but in general any of the common green-leaved plants might be eaten. There was no evidence that bark or roots were consumed. Farmers reported that the animals frequently gathered green vegetation and left it outside in piles to "cure" into hay, taking it into the burrow presumably to store up, a proceeding analogous to the habit of the cony, *Ochotona*, but no such hay-piles were noted. Perhaps the foliage is stored up only at the end of summer, when the green leaves are about to disappear.

This animal is stated by Dr. Anthony not to be extensively preyed upon by hawks or owls, because of the dense cover of the vegetation beneath which it works, and its nocturnal habits. However, predaceous animals use its burrows and runways, for two weasels, *Mustela saturatus*, were caught on successive nights in one runway, and he was told that spotted skunks, *Spilogale*, were not uncommonly caught by the farmers in traps set for aplodontias.

THE ISLE OF BOOBIES

(Continued from page 360)

was taken to the niche whence it came, and regretted that I had become so deeply interested in the birds that I failed to keep a closer watch over the activities of my companions. It is unfortunate that, with the most innocent intentions, men so often upset the lives of their weaker neighbors!

I found one full-grown tropic bird sitting in a miniature cavern in a rocky outcrop. As I approached, it hissed and retreated deeper into the cavity of the rock. When I placed a hand beneath it, to learn by feeling whether it covered eggs or young, it made no attempt to strike, but continued its hissing expirations. When I attempted to lift it gently, it moved toward the mouth of the crevice and uttered a low cry. Then it disgorged three fish of moderate size that it had recently eaten, and flew off, leaving an empty nest.

I had wished to pass a night on the Cay, but had been informed that I should find no place to camp. Actually, I could have slept very well in the woods on top of the pinnacle, if I had only made arrangements to do so. Reluctantly, I tore myself away from the boobies and the tropic birds, and all the fascinating life of a coral islet. To one who finds delight in birds, a visit to a breeding colony of sea birds is one of the most satisfying of experiences.

THE READER'S MARKET

A place where members of the American Nature Association and readers of Nature Magazine may find many interesting offerings or may advertise themselves, at low cost, for things wanted; things they have for Sale, for Trade, for Sale or Trade. This is an excellent forum for acquiring or disposing of such items as binoculars, books, cameras and photographic equipment, magazines, sports and outdoor equipment, etc.

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2. *All orders subject to these conditions:* We reserve the right to edit all copy to conform with our standards and to reject or discontinue any advertisement which we consider undesirable.

3. *Who may advertise:* This department is an open market trading post. Any individual or firm whose advertisement and methods of doing business meet our requirements may advertise their goods or services.

4. *Rates:* All classified advertisements must be accompanied by remittance. The rate is 15c per word including name and address—minimum charge $2.00. Cash with order.

5. *How to count numerals etc.:* Groups of figures are counted as one word. Abbreviations consisting of initials or single characters likewise are counted as one word. Hyphenated words are counted as two words.

6. *"For Sale" ads must state prices:* A specific price must be stated on all FOR SALE ads —except that the phrase "write for catalog" may be used when listing real estate or merchandise in quantities.

7. *Conditions of trade or sale:* The condition of binoculars, cameras, instruments, other equipment useful to outdoor lovers, home-owners, etc., advertised for sale or trade must be specified as follows: PERFECT—meaning factory condition; EXCELLENT—meaning new condition, implying negligible amount of use; VERY GOOD—meaning practically new condition, implying little use, with no appreciable wear and only minor surface scratches or wear; GOOD—meaning moderate condition and with only moderate wear; FAIR—meaning no parts missing necessary to use, reasonable wear inside and out; POOR—meaning marred appearance or badly worn.

8. *Non-specific phrases barred:* Phrases such as "highest" or "top prices paid", as well as any other so-called "auction-type" phrases are not acceptable. The terms "fair price paid" or "state price wanted" may be used.

9. *Blind ads not acceptable:* Box number or blind ads will not be accepted. Give your complete name and address to insure prompt delivery of all mail or telegraph replies.

10. *Requesting privilege of examination:* Purchasers desirous of examining merchandise before acceptance should request shipment by express C. O. D. with examination privilege. This procedure permits the purchaser to inspect the merchandise in local express office and authorizes the express company to return unsatisfactory merchandise at shipper's expense.

11. The association will not accept for publication in NATURE MAGAZINE, advertisements of firearms, ammunition, or patent medicines.

12. *Responsibility for illegible copy:* Type or print advertisement plainly as we cannot be responsible for errors due to illegible writing.

13. *Closing date:* The closing date of all advertisements is the 20th of the second month preceding month of issue.

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LIVING COCOONS: 15—$1.00. Pupae $1.25 dozen. Butterflies, moths, $1.25 dozen. Postage extra. Miller, box 47, Station "E", Brooklyn 7, New York.

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Under the Microscope

By JULIAN D. CORRINGTON

BROWNSCOPE

FEDERAL MODEL 40

TESTA MODEL G

THE NEW MICROSCOPES

SEVERAL visitors to our office a short while ago wondered whether they were in a salesroom, a museum, or at a microscope fair. Lined up on a long table were ten microscopes, five being postwar products of, with one exception, companies new to this field; five were prewar instruments, both miniature and standard. Ten slides as alike as possible—cut from the same block and stained in the same batch—were mounted on the ten stages and identical illuminants were set up before the ten instruments.

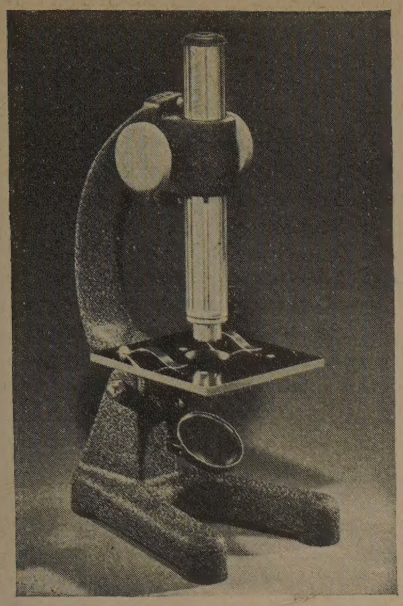
The test object used in making these comparative observations was a cross section through the neck region of a cat, showing trachea, esophagus, large lymph glands, huge vessels, and many big medullated nerves. Brilliantly stained in hematoxylin and eosin, a slide of this type is unsurpassed in evaluating ordinary performance. We were not concerned with the determination of magnification, or numerical aperture, or application of the star test, or use of standard diatom test plates. What we were after was simply a comparison of crispness and definition of the several images as judged by the eye alone—performance of the various models in terms of the way in which they would be used by the run-of-the mill microscopist. We were also, of course, examining with some care all of the details of construction of these microscopes. The results of this survey are digested in an accompanying table, and are published in response to numerous questions from readers as to relative merits of the new instruments.

After giving the matter much thought, we have come to the conclusion that we cannot in fairness rate any of these microscopes in a linear series, from poorest to best, stating that one is better than another for specific reasons, since the prices vary about in proportion to quality of construction and performance. Thus, an instrument that is inferior as to workmanship and clarity of images could be said to be "poorer" than another only if the two were about of an equal price. If the "poorer" one is quite a bit cheaper, then the lower quality is only natural and to be expected; the two instruments may be on a par, when the price factor is included in the picture, as it should be. Our final opinion is that each microscope here considered represents a fair buy at the price asked and under present conditions; that each is the "best" microscope on the market at its price, and that prospective buyers will have to weigh a number of factors, one against another, before making a decision.

As to Terminology

We lack a suitable designation for the kind of microscope represented by these new instruments. Mostly they have been referred to as "amateur" microscopes, thereby perpetrating and perpetuating an error in definition against which we have often railed. An *amateur* is not a beginner, or a bungling tyro, or inexperienced, butterfingered clown, as so many misusers of this word think; he is simply a person who does not practice the art in question as a profession; does not, in this case, earn his livelihood through knowledge and use of microscopes. Many amateurs are also experts. Many professionals, as the average college teacher of biology, are not much beyond the beginner's stage in microscopy. Amateurs in this field, who go in for microscopy in a serious way, usually own quite an array of expensive equipment, including a number of costly, standard microscopes, and would scorn ownership of an "amateur" instrument. The manufacturers, too, are not keen about having their products dubbed as "amateur" because of this opprobrious, false meaning now firmly fastened to a once respectable word.

Before the war, this form of microscope could properly be termed *miniature*, as all then made were of small size. Today that is not necessarily the case, and the term is no longer appropriate for all. Manufacturers shy away from this word too, quite properly, for the implication is plain that the object is a toy, not to be taken seriously save by the child. Our own choice would be to refer to these microscopes as *substandard*, with reference to size or design or cost—but you can just hear the howl of protests that would be raised by this insulting phrase. "Home" microscope is not apt, since many are used in laboratories, both in high school and college biology courses. Hence, having racked our cortical substance in vain, we are



ROWE MICROSCOPE

going to pass the buck on to you. (See separate announcement of prize contest for most suitable name.) Meanwhile, for purposes of this discussion, we shall have to continue referring to these new instruments as amateur microscopes.

Choosing the Right One

The right microscope for John Jones may not be the best for Tom Brown. There are many factors to consider. *Price* is usually important for most people, and will generally help make the selection. Here it must be kept continually in mind that the prices of microscopes are no different from those of everything else. They have risen tremendously in postwar days. You cannot begin to get as fine a quality of instrument for the same money now as in 1940. For example, there is no microscope made today that can compare with the former Bausch & Lomb amateur Model R until one has raised his ante to a figure *more than three times* the price of that antebellum instrument!

Another point of utmost importance here, especially for the inexperienced buyer—there is a rock-bottom price below which one simply cannot expect to go, now or at any time, and still secure an instrument worthy of being called a microscope. A precision instrument, made of superior materials, by high class craftsmen, durable, and capable of doing what you expect it to do, cannot be bought for a song or in department stores. That bottom price fluctuates with the times, but is represented today by the Brownscope, at $16.50. We know of nothing cheaper that has any merit at all. Another caution—one must not expect to compare this $16.50 instrument with a standard microscope made by B & L or American Optical; they simply are not the same thing at all, and one must not expect the $16.50 machine to reveal all of the wonders of the microscopic world.

Our experience has been that a large number of beginners are hipped over the idea of studying bacteria; in fact, bacteriology may constitute the sole aim in securing a microscope. More often than not, most of these folk likewise expect to buy a microscope for sums ranging between ten and twenty-five dollars. They may have been misled by false and flashy advertising. Our advice in such cases is—"forget it." Wait until you can take a regular, supervised, laboratory course in bacteriology in college, where microscopes are provided for the purpose. This counsel is because bacteria are so minute that only very expensive lenses can be used, and the subject is unsuited for beginning work. Every microscope discussed here has its place and its uses, and they should not be expected to yield results beyond that of their class. Quite obviously, the more you pay for a microscope, the better it should perform, providing you know how to use it.

That brings up the sad case of the rich boy who decided that he would make microscopy his hobby. Sending away for a catalog of one of the larger standard factories, he ran his finger down price columns and ordered the most expensive instrument in the book, on the theory that the one that cost the most would be the best. He received a research microscope stand equipped with apochromatic objectives and compensating eyepieces. Not understanding the purposes for which this elaborate equipment is designed, nor knowing in the least how to operate it, he complained to the factory, within a short time, that he was not getting any better results looking at his flea slide than his pal who had a twenty-dollar amateur microscope. Yet he had paid well over a thousand dollars for his instrument—how come? We doubt if the manufacturers were ever able to get over to this well-meaning but ignorant boy the fact that he was trying to run before he had learned to walk.

The most important consideration in buying a microscope is therefore not price, but the *use to which the instrument will be put!* Are you really prepared to cope with bacteriology and is this your chief interest? Very well, then you must save until you can afford one of the more expensive models of a standard make of instrument, which *begin* at the $250.00 level. There is no alternative; no cheaper instrument will serve; it is a case of put up or—change your hobby. Protozoa? A somewhat less elaborate standard microscope will be essential here, unless you are to go in for real research. You may start at the $150.00 level.

There are other interests that call for these more expensive microscopes, but there are also a much larger host of specialties that do not. Elementary work on paper, textiles, and industrial residues; botanical and zoological whole mounts and sections, as diatoms, flowers, fruits, seeds, insects, microcrustacea, embryos, parasites, and sections of plant stems and leaves, amphioxus, earthworm, and vertebrate tissues and organs; crime detection studies with fingerprints, typewriting, handwriting, and bullet scratches—all these and numberless others, more often than not, call for low rather than high magnification, and usually do not demand a high degree of resolution in the image. In all such cases the amateur microscopes are often entirely satisfactory. You must decide, then, as nearly as possible, what it is you are going to do with a microscope, then get the best instrument in the indicated class that you can afford.

An example of a factor upon which *not* to base a choice of instrument is power. The beginner who knows little about microscopy naturally thinks that the higher the power, the better the instrument. This may be true, but better for what? The list of objects just recited calls attention to the great array of specimens for which low magnification is actually better, for most purposes, than high power. Magnification alone, without corresponding resolution, is worthless and is known as "empty magnification." By resolution is meant the capacity of a lens to discern (resolve) two very closely spaced objects as two, instead of as a single fuzzy one. Only a properly resolved magnified image will show anything worthwhile. To convince yourself of this, examine a newspaper photograph through a handlens. You are using greater magnification than with the unaided eye, but you will see less detail in the photograph. It is broken up into a series of meaningless dots—the halftone screen—and your enlarged view is worthless. It is empty magnification. This case is an analogy rather than an example, but illustrates the point in a forceful manner.

Should you buy a good amateur microscope that you can afford now, or is it better to wait and save up to secure a standard machine later? Each person must decide such a question for himself. Generally speaking, it would be wisest to get the amateur instrument now and have the use of it, learning how to operate and study with a microscope in case you are not already familiar with one. Later you can trade in or sell your first model when you are able and ready to buy the more expensive outfit.

Is it better to buy a new amateur microscope, or a secondhand standard instrument? Here again, no categorical answer can be given. Everything depends on the condition of the secondhand model and the price asked for it. The deal is risky unless you know microscopes well enough to judge condition and quality. Are the lenses in perfect condition, or is one element loose or scratched? Anything less than perfect will not do. Does the fine adjustment work easily, without wobble or backlash? This is a delicate and expensive part of the machine, costly to have repaired. If you are buying the instrument from a dealer, he will certify

the true condition and can be relied upon, but the price will be much higher than that of an amateur scope.

Factory rebuilt or reconditioned microscopes are also secondhand, but constitute a special class that have been put in the best possible condition by factory experts. They are as good as new in most cases, merely appearing somewhat shopworn—a trivial matter with microscopes—or represent an obsolete model—out of date as to type of fine adjustment or of finish of metal parts—whether brass or chromium—likewise trivial. If you can get a good secondhand or reconditioned standard microscope at anywhere near the price of the best of the amateur instruments, then grab it by all means; the seller is undoubtedly suffering from dementia precox. On the other hand, if the seller is known to be sane, then proceed with caution—there would seem to be a Senegambian in the woodpile.

Remarks on the Manufacturers

American Optical Company, Buffalo 15, N. Y. The Scientific Instrument Division of this firm manufactures Spencer scientific instruments, including a full line of standard microscopes, and was formerly the Spencer Lens Company. There is no indication that they intend entering the field of manufacture of "amateur" microscopes. They have never done so in the past and today's high costs would seem to preclude the undertaking for a large firm in which the overhead is great.

Bausch & Lomb Optical Company, Rochester 2, N. Y. This, the largest optical house in America, manufactures a complete line of standard optical instruments. Formerly they made the Gem, New Gem, and Model R, the best "amateur" microscopes ever marketed on this side of the Atlantic. These were discontinued when the plant was converted to war needs and our advice at present is that B & L will not resume manufacture of what was to them a small side-line. Changing circumstances in the future may alter this decision.

Brownscope Manufacturing Company, 24 W. 45th St., New York 19, N. Y. We have been unable to determine to what extent this company manufactures, and to what extent it acts as jobber or dealer for the optical equipment it advertises and sells. The microscope sent us for examination bore the Brownscope name plate, but was the same as the Monroe, now the Rowe, although retailing at a lower figure. We found the basic model, with 75X magnification, to give the best quality of image of any instrument short of the Federal, speaking of costs. On the other hand, the extra objectives, designed to screw on over the first, and supposed to provide final magnifications of 300X and 600X, were utterly worthless, yielding only empty magnification. Considering that one cannot expect precision adjustments in this price class, this microscope is a heavy, durable instrument, satisfactory for all uses where a magnification of 75X will suffice. It cannot compare with

CHIEF FEATURES OF THE NEW MICROSCOPES

FEATURE	BROWNSCOPE	ROWE	TESTA, S	TESTA, G	FEDERAL
Height, inches	12	12	10	10	11¾
Weight, pounds	5⅛	7	2½	3⅝	4½
Stand	metal, crackle finish	metal, crackle finish	metal, crackle finish	metal, crackle finish	metal, satin finish
Inclination joint	present, partial tilt	present, partial tilt	present, partial tilt	present, partial tilt	present, full 90° tilt
Mirror (single surface on all)	1⅝", plane, 2-motion	1⅝", plane, 2-motion	1⅛", slightly concave, 3-motion	1⅛", slightly concave, 3-motion	1⅞", concave, 2-motion
Stage	square, 4", glassy finish, resistant	square, 4", glassy finish, resistant	square, 3½", plastic, resistant	square, 3½", plastic, resistant	square, 4", metal, resistant
Diaphragm	none	none	none	disc, poorly built	disc, good
Spring clips	two, removable with screwdriver	two, removable with screwdriver	two, not removable	two, unscrew by hand	two, removable, plug in
Body tube	aluminum, brush finish	aluminum, brush finish	aluminum, brush finish	chromium plated	aluminum, brush finish
Draw tube	none	none	present	present	present, graduated
Adjustments	one, intermediate, considerable backlash	one, intermediate, considerable backlash	one, intermediate, satisfactory	one, intermediate, not examined	fine and coarse adjustments coaxial, ratio 4:1, slight backlash, satisfactory
Objectives	one, 7.5X, achromatic, screws onto tube, interchangeable	one, 7.5X, achromatic, screws onto tube, interchangeable	two, 6.5X, 10X, not achromatic, plug in, not standard for interchange	three, G-1 built-in, 7.5X; G-2 added, 15X; G-3 added, 20X; achromatic	two, 10X, 20X, convertible by sliding interchange; achromatic
Eyepieces	one, 10X	one, 10X	one, 10X	one, 10X, variable by separate extension	two, 5X, 10X
Final magnifications drawtube in	75X; with extra objectives, 300X, 600X	75X; with extra objective, 150X	65, 100X	75X, 150X, 200X	5X ocular, 50X, 100X; 10X ocular, 100X, 200X
drawtube out			130X, 200X	150X, 300X, 400X	5X ocular, 75X, 150X; 10X ocular, 150X, 300X
Image quality	wide, bright, flat field; clear; very good	wide, bright, flat, field; clear; very good	field dull, hazy, definition poor	Medium bright, definition fair, image good	excellent, nearest to professional quality of any
Plastic cover	none	cliofilm	temporary bag	temporary bag	finished hood
Case	none	none	wooden, extra	wooden, extra	metal, extra
Accessories	two additional objectives, 30X, 60X, screwing on over first; extra; worthless	one additional objective, 15X, screwing on over first; extra; not examined	two prepared, three blank slides; polarizing discs, extra, fairly good	same as Testa S	25X eyepiece
Instruction booklet	Johnson, *Hunting With the Microscope*; good	none	very good original manual, includes some elementary technique	same as Testa S	very good original manual, excellent on parts and operation
Prices	$16.50; with extra objectives, $19.50 (one), $22.50 (two)	$19.95; with additional objective, $24.50	$29.50; polarizing discs, $3.25; case, $6.50	G-1, $42.50; , G-2 $47.50; G-3, $52.50; polarizing discs, $3.25; case. $6.50	$59.00; case, $8.50

prewar B & L or Wollensak models; but if those were being manufactured today they would, presumably, cost twice to three times their former figures. Hence the Brownscope is an excellent buy for the money under present conditions.

This make, as well as certain others, uses standard-sized eyepieces and has the tube threaded to receive standard objectives of any make (Society screw threads). This is not a convincing selling point to us, however, as no one in his right mind would use a Zeiss 4 mm. objective on a Brownscope stand.

Federal Manufacturing and Engineering Corporation, 199-217 Steuben St., Brooklyn 5, N. Y. Federal, before the war, was an established manufacturer of photographic equipment and accessories, and has now invaded the microscope field with their Model 40, known in the trade as the FM-40. They also go in for electronic, radio, and still other scientific instruments and equipment, and have an excellent reputation. The Federal 40 is definitely the best of all the newer microscopes and, in line with what we have been saying, is the highest priced. The appearance and performance of this microscope more closely approaches a standard model than does any other, and will be found entirely satisfactory for all powers up to the limit of 300X. This means that the Federal is not intended for use in studying bacteria, chromosomes, malarial organisms or other extremely small objects; will give only fair results with protozoa, blood, and certain histological preparations; but will be splendid for all that other category of objects we have listed for the lower powers.

Especially interesting is the adjustment mechanism of the Federal. The larger left head is the coarse adjustment, the smaller right knob the fine adjustment, the two being coaxial and working on the same shaft with a four-to-one ratio; this is a clever and efficient arrangement.

Foreign Microscopes. American firms in this business, as in others, have seen to it that protective tariffs either keep out foreign competition (e.g., British) or admit instruments under cartel agreements or such duty as will force the retail price up to the American level (e.g., former German companies). The result has been that one could buy Zeiss, Leitz, or Reichert instruments through New York agencies, but could not secure a Watson, Beck, or Swift instrument without ordering direct and paying the duty extra. Today, one can obtain standard models of most foreign makes, except Zeiss, which has been gobbled up by the USSR, if he so desires.

In the amateur field, there were excellent prewar instruments—British, French, Swiss, German, Austrian, and Italian, that retailed abroad for considerably less than our American microscopes, but could not be imported at less cost because of the duty. We have no information on any of these today. Presumably any of these smaller microscopes that are being made now are no more welcome over here, tariffically speaking, than were their predecessors, and their makers do not as yet find our markets sufficiently alluring for them to crash. Contrariwise, some of our amateur instruments, Federal and Testa in particular, are being exported to many foreign countries.

General Science Service, 1927 Hennepin Ave., Minneapolis 5, Minn. This is a unique firm, who tell us that their aim is not sales but teacher-training. They carry a considerable line of specimen-charts for geology, and manufacture two models of polarizing microscopes, one model each of biological, elementary science, and dissecting microscopes, table magnifier, lamp, and projection prism assembly. Sales are made chiefly to grade schools, somewhat less to high schools, and not at all to individuals, hence we have not sent for their instruments for examination and comparison with others listed here.

Their illustrations depict handsome and sturdy-looking instruments, ranging in price from $24.75 for the elementary science model to $49.75 for the better polarizing microscope. The claim is made that since they sell only direct to schools, the dealer's commission—35 to 50%—is saved, and that hence the customer receives more for his money. Their belief, undoubtedly a point well taken, is that it is better for a school to own three of these microscopes, within the capacity of both teacher and students to operate properly, than one standard model whose 4 mm. objective and fine adjustment are unnecessary, seldom used correctly, and run the price up to the $124.00 level. We would agree with this statement as applied to grade schools. Teachers interested in further information may write direct to this firm.

Walter E. Rowe Company, 137 Gould St., P.O. Box 1, Brighton Station, Rochester 10, N. Y. When we first contemplated perpetrating this article, one of our intended victims was the Monroe Gasket and Manufacturing Company of Rochester, who were making the Monroe M-1 microscope. Among the first postwar instruments on the market, this one was named for Monroe County, which has the honor of housing the center of scientific instrument manufacturing in the Western Hemisphere. The manufacturing facilities for this microscope have now been bought by the Rowe Company. We note from their advertisement in this year's February issue of *Nature Magazine* that the microscope itself does not have a name; it is no longer referred to as the "Monroe," so we are calling it the Rowe. O.K., Walter?

As remarked under notes on the Brownscope, the instruments sent us for examination by these two firms appear to be identical. More recent indications point to a modification of the original Monroe M-1 by its new makers since the weight now advertised is seven pounds (a figure we have inserted in our table) whereas the weight of the model sent us was five and one-eighth pounds. Likewise the Rowe Company has discontinued the former extra objectives (concerning which we have expressed ourself most unfavorably) and have concentrated on a single additional unit to increase the power to 150X. This is said to be achromatic and to compute close to 180X, and to yield an excellent image, but we have not examined it. The makers report that prices for their instruments vary with different dealers, but that they are making an attempt to stabilize them. This should be done by all means, so that the product sells at a uniform price.

Testa Manufacturing Company, 418 South Pecan St., Los Angeles 33, Calif. Middle ground in price and quality among new microscopes is occupied by Testa, with three models and seven price ranges, from $29.50 for the model S to $52.50 for the G-3. These instruments are slightly smaller than others, lighter in weight, and present a neat, finished appearance of which the owner may well be proud. We found some points to criticize, and have been much pleased at the reaction of those in authority at the plant, for these criticisms were welcomed and steps taken or completed to improve the specified complaints. Such an attitude is as unusual as it is praiseworthy; in other connections, not microscopical, we have received nothing but alibis instead of cooperation.

The model S has the simplest form of stand, so as to retail in a lower price bracket. We found the optics of this model in need of further study and improvement, and understand this work has been done. Model A uses the stand of S and the better optics of G, and is hence intermediate in price: A-1, 75X to

PRIZE CONTEST ANNOUNCEMENT

In our feature article for this month attention is called to lack of a suitable name for a particular class of microscope. This Department will pay five dollars for the best name submitted, provided that this name is considered worthy of adoption. In case two or more persons send in the same suggestion, that one bearing the earliest postmark will be judged the winner. Letters or postcards will neither be answered nor returned and names submitted become the property of this Department. Winner and new designation will be announced in a future issue. Contest closes midnight, September 30, 1948. Address Dr. Corrington as per the Florida address given at the end of the main article.

150X, $37.50; A-2, 75X to 300X, $42.50; A-3, 75X to 400X, $47.50. Each of these is a good value for the price asked at today's inflated money.

The G stand is superior. We did not like the focusing apparatus: there was a so-called fine adjustment knob on one side, offset from the opposing coarse adjustment head, with too much backlash, the fine adjustment being more or less ineffectual. This arrangement has now been eliminated, we are told, in favor of a single adjustment, said to operate much more smoothly. Likewise we criticized the disc diaphragm as being of inferior construction, and this, too, we understand has been corrected. Lest this account seem to emphasize defects, we will again state that the instruments have general excellence and that these defects have been corrected.

Wollensak Optical Company, Rochester 5, N. Y., has not yet resumed manufacture of their well-known and excellent amateur microscopes. Photographic lenses and shutters, they inform us, are taking all of their facilities. They expect to resume some time in the near future and, if so, readers will be informed through these columns.

Where and How to Buy

Brownscope, direct from Company. Rowe, from dealers or direct. Testa and Federal release their instruments only to distributors, including well-known optical, chemical, biological, and scientific supply houses, which in turn ship the instruments to thousands of dealers throughout the land. Those living in cities should look through the classified section of their telephone directory under the headings "Optical Goods," "Scientific Instruments," or "Surgical Supplies." If unable to secure the desired information or place an order, write to the manufacturer for the address of the nearest dealer, or send a self-addressed reply postcard to Dr. Julian D. Corrington, 1306 Madrid St., Coral Gables 34, Florida. Information as to your nearest dealer will be furnished promptly.

SUCCESS AT SEED SAVING

(Continued from page 372)

their seeds through the air, and the seed-carrying down of willow and cottonwood travels far in a strong wind. In reclaimed parts of the desert cottonwoods are used for shade trees, and it is not uncommon to find cottonwood seedlings coming up along irrigation ditches that have been dug far from any tree. The seeds have great longevity and can remain dormant in the sand for a long while. A great many seeds belonging to the daisy family have fly-away seeds, and when I am gathering seed of *Chaenactis*, the parachutes of unwanted blow-wives, which always live in colonies of *Chaenactis*, are hard to keep out of the bag. Except in seed, blow-wives is an insignificant plant, for its flower is not attractive, but the large, round seed-heads always catch the eye.

Seeds surrounded by juicy pulp, such as are popular with birds and some humans, get me into a lot of trouble because they become a mess no matter what container they are put into. Currants, huckleberries and honeysuckles come home looking more like jam than clean, business-like seedsman's loot, and have to undergo a lengthy treatment of a special sort. The huge, fleshy blobs of opuntia cactus, all set with tiny thorns, are a problem, and the large flat seeds of lemonade berry, which are enveloped in sticky, sweet-sour stuff beloved of flickers, thrashers and other large birds, are among the seed collector's crosses. *Garrya elliptica* is an engaging wild shrub with thick, shiny, evergreen leaves and long catkins of great beauty. The catkins, which swing from the female bush, bear round berries encased in brittle gray. In July, after the sun turns them to a wine-red and the pulp around the seed goes the same inviting color, the seeds go black. Then come the birds, hummingbirds and other small juice-sucking or berry-eating birds, to puncture the shells, drink the beverage and either eat the seed or let it roll, now shrunken and dry, to the ground, leaving the lacerated tassels hanging limp and shattered.

I have always loved flowering bulbs, but when I became a seed collector my affection toward them doubled, for each capsule contains many seeds, and if the top of the pod is dry and brown all the seeds in that pod will ripen in the bag. Of course there is the usual risk of getting on the spot too early or too late. If it is too early and the location is not too many hundred miles from home, there is the chance of getting back, but if it is too late I walk through tall stalks capped by empty gaping pods, which make a hollow mocking sound as I tread, and hunt in vain for the unspilled cup.

Although the seed gatherer's disappointments may at times come thick and fast, there are also counterbalancing joys and many delightful surprises. I may cover half a state in order to get to the place where a plant, whose seed I have promised, makes its home, only to find that deer have beaten me to it, or if the seed is a flier, a strong wind has taken it off. Drought may have been so severe that no seed that year has formed; forest fires may have visited the spot, leaving nothing but sickening grimness or drought. But en route there, and on a different way back, I may run into ripe seed of several species I had not hoped to find, experience which, with the glowing happiness of such a jaunt, quite makes up for the loss of time and money.

AUGUST-SEPTEMBER SKIES

(Continued from page 379)

of August and September much of the splendor arising from the appearance of bright planets in the evening sky is missing. Venus, which was of spectacular beauty in the spring, is now in the morning sky, and a magnificent object as always. It rises several hours before the sun and will be at greatest distance west of the sun on September 2. The planet Mercury will be poorly placed throughout this entire two-month period. It will be in inferior conjunction with the sun on August 11, and only six degrees above the western horizon at sunset at time of greatest eastern elongation on September 25. Mars will be low in the southwest at sunset in August and sets within two hours of the sun. It will pass a few degress north of Spica in Virgo on August 22. In September it still may be seen for an hour or so after sunset near the southwestern horizon. In parts of Canada there will be an occulation of Mars by the moon in the afternoon of September 6. Jupiter is in Ophiuchus these two months. It is nearly due south at sunset and sets about midnight on September 13, when it is in quadrature with the sun. By the end of that month it will be well past the meridian at sunset. Saturn will be in conjunction with the sun on August 18, and will not be seen that month. By the latter part of September it may be seen in the morning sky very close to the eastern horizon. On September 11 it will be within a degree of Regulus in Leo.

On September 22, at 10:22 P.M., Eastern Standard Time, the sun will cross the equator going southward and autumn will commence in the northern hemisphere and spring in the southern hemisphere.

Bird Dogs

Bird Dogs. By Ray P. Holland. New York. 1948. A. S. Barnes and Company. 204 pages. Illustrated in color and black and white. $5.00.

This is a complete book on the breeds, foundations and standards of all dogs used on the march and in the field. It covers the individual breeds one by one, then discusses training and other aspects of working with these dogs.